The Journal of Occupational Diseases and Traumatic Surgery

Industrial Medicine

for

Physicians and Surgeons in Industry

Volume 9 JUNE, 1940 Number 6

THIS ISSUE

The Traumatic Abdomen
—Penetrating and Non-Penetrating Wounds—

Criteria of Cure
—In Occupational Diseases—

Fatal Traumatic Pneumonia
—Case Due to Extrathoracic Trauma—

Plastic Repair
—of Cutaneous Injuries of the Hand—

Medicolegal Typing
—of Occupational Disease Cases—

Central States Society
—Proceedings of Twenty-First Annual Meeting—

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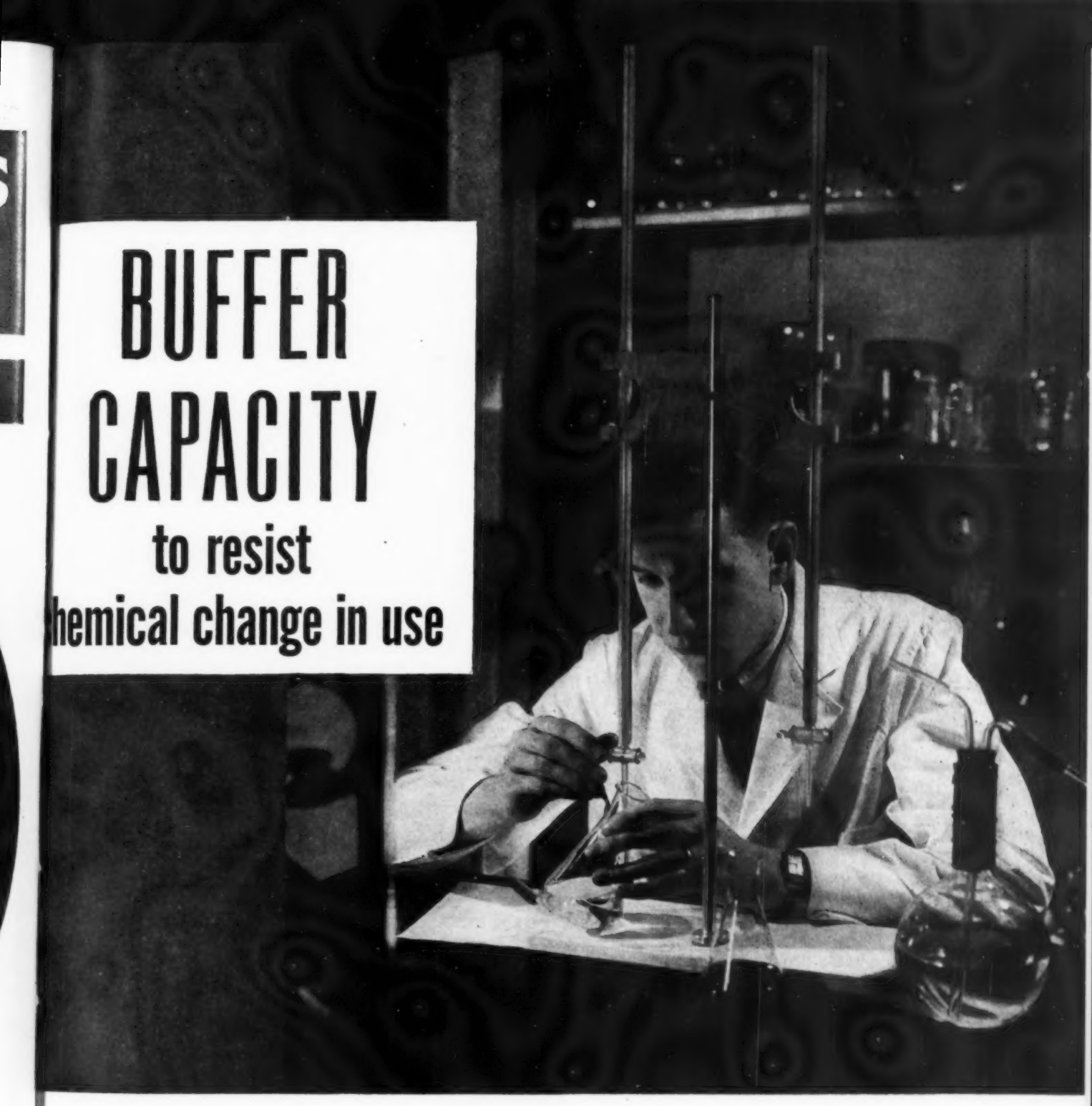

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Volume 9 JUNE, 1940 Number 6

Industrial Medicine

THIS MONTH

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DR. BANCROFT'S article, "The Traumatic Abdomen," with which this issue begins (page 285) is indeed, as DR. GUY'S discussion characterized it, an "excellent paper." His subject is one of prime importance now, and his handling of it is masterly. « » DR. GOLDWATER (page 294) correctly assumes that "the subject of criteria of cure in occupational diseases has not received the attention it deserves." In his article on that subject he brings the matter up to date in a manner considerably more complete than his closing paragraph admits. « » MR. DEICHMANN'S "Ingestion of Phenol" (page 296) is an important addition to the literature of toxicological experiment. « » DR. VACCARO, in his "Fatal Traumatic Pneumonia" (page 298) presents a case due to extrathoracic trauma, and concludes to the effect that it "presented a series of events which definitely established a direct connection between trauma and pulmonary pathology." « » DR. GREELEY'S "Plastic Repair of Cutaneous Injuries of the Hand" (page 300) leads up to conclusions which well serve as precepts of guidance. They are from an enviable experience, and have the weight of authority. « » The CENTRAL STATES SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY held its Twenty-First Annual Meeting at Peoria, last month, in conjunction with the Centennial Anniversary of the Illinois State Medical Society. A complete abstract of the proceedings appears on pages 304-308. « »

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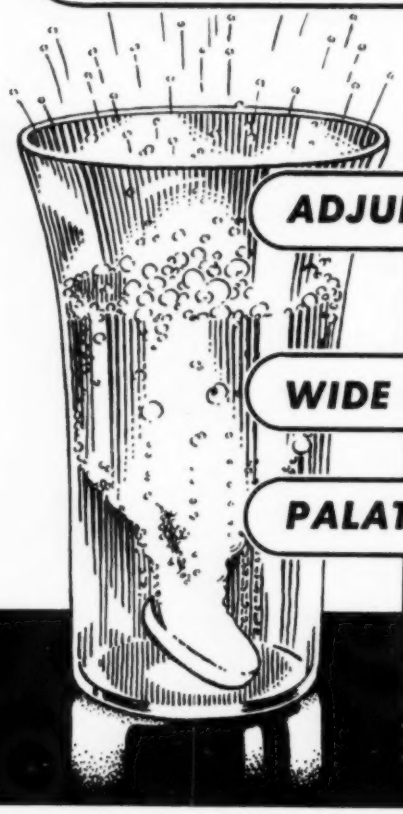

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DR. SAPPINGTON'S subject, "Medicolegal Typing of Occupational Disease Cases" (pages 308) is one in which he is expert. Its text is an epitome of extensive experience and authoritative knowledge, and will well repay the careful study and thought it deserves. « » DR. PULLEN'S "Mouth and Throat Disorders" (page 310) deals with some interesting studies of the common cold. « » DR. MILLER (page 312) presents the case for the "electrocardiogram," and its value in physical examination. « » THE comments on "Salt for Industrial Workers" are, perhaps, a little unfair to some of the pioneers, DR. LOYAL A. SHOUDY, for example, whose work along this line goes back beyond the times covered by the "comparatively recent years" in which the matter of control of the industrial hazard of heat cramps has been of immediate interest to industry. The comments, however, are interesting. « » DR. HUNNICUTT (page 315) hits the high spots in a general review of "Wound Treatment, Past and Present." « » THE editorial (page 318) goes far afield into an economic discussion, but industry, and, therefore, industrial medicine, is bound up with economics. And, one might add, tied up with so-called economic panaceas fostered in high places. « » AIR Hygiene Foundation has gone into the study of absenteeism with serious purpose (see page 319). « » DR. SHAFER, of the Committee on Healthful Working Conditions, of the National Association of Manufacturers, sends along the study of "Industrial Dermatitis" (page 319) which we are glad to present to our readers. « » DR. LAUTENSCHLAGER (page 322) reports upon certain methods he has found favorable. « » DR. BUTLER (page 324) introduces the subject of "Venomin" in the treatment of various afflictions. « » DR. SAPPINGTON reviews some current articles (page 327). « » AND the issue suspends upon a short discussion of

—Continued on page 11.

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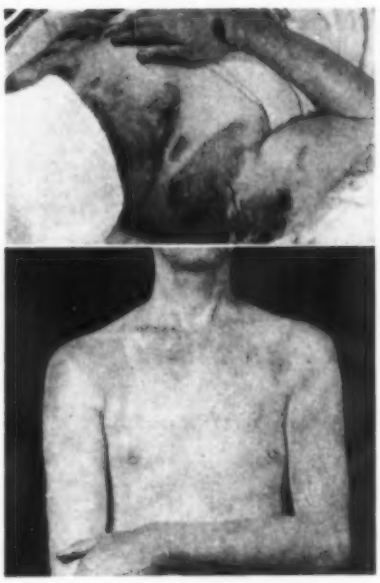

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—*Continued from page 5.*

"whether a physician who is professionally employed more or less frequently by insurance carriers can be termed 'impartial' from the viewpoint of the workmen's compensation claimant." « » THE Annual Meeting of the MICHIGAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS was held in Grand Rapids, Michigan, on Wednesday, April 17, 1940. An interesting program was presented. One of the papers, DR. MARKUSON'S on "Industrial Medicine and Industrial Hygiene," was published in INDUSTRIAL MEDICINE for May (page 261). At the business session held at 5:00 P.M. a report of the special Commission on the Revision of Constitution and By-Laws was received, and a new and amended constitution and by-laws was adopted.

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The Journal of Occupational Diseases and Traumatic Surgery

With which are consolidated "The Industrial Doctor" and "International Journal of Medicine and Surgery."

The Science, the Law and the Economics of Industrial Health

Volume 9 JUNE, 1940 Number 6

The Traumatic Abdomen

—Non-Penetrating and Penetrating Wounds—

FREDERIC W. BANCROFT, M.D.,
New York City

A NORMAL-APPEARING skin frequently covers a multitude of sins. As an example of such conditions I should like to show two lantern slides, one a cross section of a healing laparotomy wound, 12 days postoperative. The skin is normal in appearance. Beneath the skin one sees where the muscles were sutured together, and a suture appears with a marked round cell infiltration. One can also see a seroma with areas of hemorrhage infiltrating the muscles extending for a considerable distance on each side of the original incision. The other is a rabbit's leg which, under ether anesthesia, was fractured with one tap of a mallet and the leg immediately encased in plaster. Twenty-four hours later the animal was sacrificed. The skin was normal in appearance. On exposing the muscles and fascia beneath, one is impressed by the marked amount of trauma. The strong muscular septa had not been lacerated, but extravasation of blood can be seen beneath them. On sectioning this muscle one is impressed by the excessive hemorrhage in the muscle and soft parts. The hemorrhage follows fascial planes and extends downward beyond the neighboring joints.

In non-penetrating wounds of the abdomen the clinician must use every means at his disposal to determine what is happening beneath the normal-appearing skin.

The correct diagnosis is vital.

Almost equally important is the surgical judgment in electing the type of treatment after having made the diagnosis. I refer particularly to the differential diagnosis between shock and hemorrhage. If operation is performed where shock is severe and the hemorrhage is not progressive, a fatality may occur; and if operation is delayed where there is active hemorrhage, death may also ensue. Therefore, where bleeding is continuous, operation with the concomitant treatment of the shock is imperative. In the newer developments in the differential diagnosis between shock and hemorrhage, recent investigators, namely, Phemister, Coller and Scudder, have given us a more rational treatment of shock. I shall spend a portion of my time in describing the clinical results of their findings, avoiding as far as possible the theories involved. It is obvious that if I attempt to enumerate all of the injuries that may occur in the abdomen it will result in a hash which will not be of interest, because most of you are acquainted with many of these injuries. I shall attempt, however, to emphasize certain factors which seem to me to be of importance.

Bailey has said: "When confronted with unmistakable signs of combined shock and hemorrhage, the problem is to determine, first, whether hemorrhage is actually progressive; second, whether the shock forbids exploration; and third, if bleeding is uncontrolled, may one hope, by rapid antishock treatment before and during entrance, to check hemorrhage, remove the cause and maintain physiologic coherence; or will it be a safer procedure to institute stabilizing therapy under constant supervision, anticipating spontaneous arrest of hemorrhage. Herein lies the crucial test of surgical judgment."

Coller has said: "The relation of shock to hemorrhage has been much disputed, but traumatic shock and the symptoms of hemorrhage are both produced by the loss of large quantities of blood. In hemorrhage from a large vessel, there is a loss of whole blood with a decrease in the red blood count, while in traumatic shock there is mainly a loss of blood plasma into the injured part, with a concentration of red blood cells in the circulation."

Presented at a Meeting of the Chicago Society of Industrial Medicine and Surgery, March 18, 1940.

In the past we have depended upon the analysis of red blood and hemoglobin, the leukocyte count and blood pressure readings, and we have had no real scientific basis on which to base our treatment. We used glucose, or glucose and saline, or transfusions, as seemed to us best at the moment, on a hit or miss plan. If we depend on these alone we are handicapped by the insensitivity of the test, for, as stated by Scudder, "The average accuracy of the erythrocyte count is a margin of 250,000." This is not sufficiently accurate to give us an idea of the actual bleeding of any given individual.

Scudder and Drew have provided for us four simple tests which, when understood, give us a much better clinical picture of the differentia! diagnosis of shock and hemorrhage and a much better concept of the treatment. If we consider shock as a stagnation of blood plasma into all the capillary spaces of the body and not into just the abdominal areas we have a better concept of its real condition.

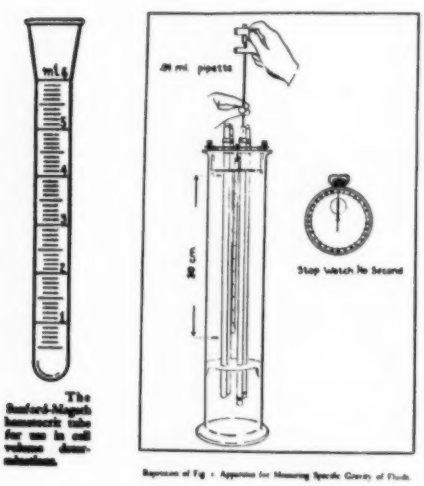

Fig. 1.
(From "Shock," by John Scudder, M.D.)

The tests presented by Scudder and Drew are, first, a hematocrit test which resolves itself into a simple test of taking 6 cc. of blood in a graduated test tube marked out in cc. adding 1 mg. of purified heparin and placing it in a centrifuge where it is rotated to 2500 revolutions per minute. In cases of emergency the time of centrifuge may be limited to 15 minutes. One can evaluate then the percentage of cells in the bottom of the tube as compared to the plasma on the surface. This gives us a definite picture of the amount of concentration or lack of concentration of the cellular elements.

Test No. 2 shows us the specific gravity of the plasma. It is pretty well shown that the inorganic salts remain constant; therefore, any change in the specific gravity will depend on plasma proteins.

Test No. 3 is the determination of the specific gravity of the blood. This is used only where one has not the plasma to analyze, and may be done by obtaining blood from the fingertip. Both Test No. 2 and Test No. 3 are done by the Barbour-Hamilton method of the hanging drop.

In 1924, Barbour and Hamilton presented a method of determining the specific gravity of body fluids which eliminated many of the disadvantages of the older methods. Its principle, based on that of Stokes' law, takes advantage of the fact that the time required for a drop of known volume to fall a fixed distance through an immiscible fluid is governed by the density of the drop and other factors, such as temperature, which can be easily controlled. By using a solution whose weight is known, as a standard against which to compare the falling time of the unknown, the necessity for accurately determining the exact density of the medium in the falling drop tubes was eliminated.

The fourth test is based on the fact that the percentage in the inorganic salts does not change and that by a simple formula one may calculate the percentage of the protein from the specific gravity of the plasma. In simple dehydration, whether from lack of fluid intake, from diarrhea, from excessive sweating or vomiting, there is present a uniform rise in the cell volume, the whole blood, the blood plasma specific gravity, and the plasma protein percentages. Likewise in cases of severe shock where there is no outward sign of a loss of fluid, but a loss of circulatory volume, one of the earliest signs is a gradual rise in the specific gravity of the peripheral blood. In addition, one sees by the hematocrit test that there is an increased cell volume; and in a test of the plasma, by taking the specific gravity one finds there is also an increase in the plasma protein. All of these changes may be evidenced for a considerable length of time before there is any change in the blood pressure or the pulse rate, and with the inaccuracy of the red blood count there may not be evidence of the increase in red cells. These tests therefore not only serve as guides to therapy but as warning signals which, if heeded, often prevent disaster.

In hemorrhage, either obvious or concealed, there is an immediate fall in the specific gravity of the whole blood and a drop in the cell volume as determined by the hematocrit. The plasma specific gravity, on the other hand, shows less marked changes, and even in severe hemorrhage the protein values as estimated from the specific gravity of the plasma may not be much below normal and do not nearly approach the percentage of loss indicated by the fall in the blood specific gravity and the hematocrit readings.

Drew summarizes the results of the findings of these tests as follows: By means of the data acquired one may determine the degrees of water loss, water plus protein loss; differentiate shock due to simple circulatory collapse from shock complicated by hemorrhage; detect dehydration in the presence of anemia, and predict the approach of an edema level of proteins. From a summary of these findings one may more rationally direct treatment for the alleviation of these conditions. If we pic-

ture shock as a pooling of plasma in the intercapillary spaces of the tissues, we must base our therapy upon the concept that this fluid is pooled due to, first, spasm of the peripheral arterioles, and second, a dilatation in the tissue spaces. It is known that sodium in fairly high concentration will relieve the arterial spasm; therefore, it is advisable to add sodium chloride often in concentrated amounts. Three hundred cc. of a 5% saline solution will often do more to combat shock than larger amounts of glucose and normal saline. Also Scudder has shown very definitely that the injection of 20 cc. of adrenal cortical extract will help increase the tone in tissue spaces. If in a case of shock, by repeating the saline and cortical extract, the blood pressure is improved and capillary and venous spasm is released, exploration to control the blood loss may be possible, if there is evidence that bleeding is continuing.

Scudder states as follows: "The average accuracy of the erythrocyte count is a margin of 250,000, while the specific gravity test as determined by the Barbour and Hamilton apparatus is 25 times more accurate." Thus, changes equivalent to .02% hemoglobin and 10,000 red cells are shown by the Barbour and Hamilton drop method of taking the specific gravity. The latter tests may be made every few minutes in critical cases, while an interval of many times as long between tests would be necessary to determine the trend of rise or fall in the red blood count or hemoglobin estimation."

Scudder continues: "In shock uncomplicated by hemorrhage the specific gravity of peripheral blood increases, indicating loss of water from the blood. In the venous blood the anhydremia may also be measured by the cell volume and the plasma protein percentage by hematocrit determinations. In hemorrhage due either to external or internal loss of blood, there occurs a fall in the specific gravity of the peripheral blood."

LET us take as an example a patient brought into the hospital with symptoms of an abdominal injury. A careful physical examination may reveal localized tenderness. If this tenderness is in the left upper quadrant one may suspect a ruptured spleen; if in the right, one may suspect hemorrhage from the liver; and if in the lower abdominal regions one may suspect laceration of the intestines. How are we to proceed? If the patient is in shock it is inadvisable to move that patient to the x-ray department to determine what we may learn from radiograph. We must therefore determine, first, whether shock or hemorrhage is in the ascendant. If we feel certain that shock is in the ascendant and that bleeding is not increased we must then treat the shock. Having overcome the immediate shock, we may then proceed to further diagnostic procedures. A peritoneal aspiration by inserting a needle of small calibre into the peritoneal cavity is of very little risk, and it may give us an indication of whether one finds hemorrhage or gas or infected fluids. If the patient improves, a portable x-ray may be used, or better, if the shock has been so diminished that we can transport the patient to the x-ray room without danger, a flat abdominal plate may give a good deal of information. Free air may show beneath the diaphragm if there has been an intestinal injury. In injuries to the spleen, it has been shown by Foster and Webb that the left diaphragm may be elevated and that the stomach be pushed to the right as shown by its gas outline. Catheterization of the bladder will show us whether there is blood in the urine and whether one may suspect injury to either the bladder or the kidneys. If there is a suspicion of a ruptured bladder the cystogram, after the injection of 2½% sodium iodide, may reveal a ruptured bladder.

Duncan and Forbes suggest, after all the examinations have been done and we are still suspicious of our patient, that the intravenous injection of morphine may give evidence particularly as to the location of the pathology. They base their contention on the fact that the brain centers controlling voluntary rigidity are numbed and the point of involuntary rigidity may then be readily noted.

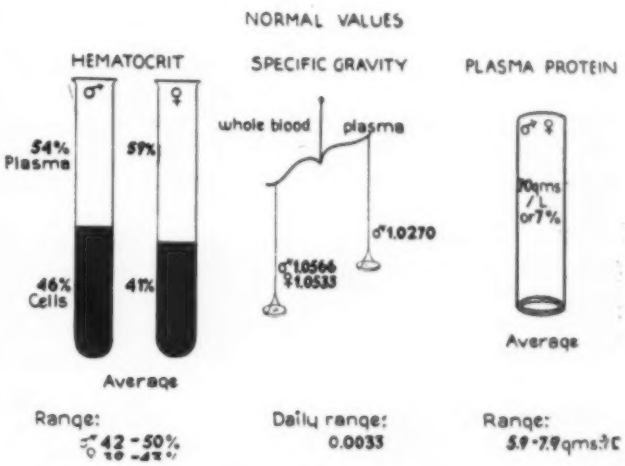

Fig. 2.
(From "Shock," by John Scudder, M.D.)

A counter-indication for this procedure is, of course, if for any reason operation is to be delayed in favor of further observation.

One must consider always, in the analysis of whether or not operation is necessary, the type of injury encountered. A sudden blow from a sharp instrument is more apt to create intestinal rupture by sudden increase in interluminary gas, while a slower injury, such as might be sustained by automobile wheels passing over an individual, may allow the intestines to move into the lumbar gutters and be protected somewhat by abdominal splinting.

In my early experiences at the Lincoln Hospital, where we had a large number of traumatic accidents, I was impressed by the fact that children are different from adults in their reaction to trauma. Children would be brought in on the ambulance in marked shock and would give many signs of intra-abdominal injury. At that time I

was fortunate enough to be associated with Dr. Fenwick Beekman, who had been on the children's surgical service at Bellevue Hospital. He recommended delay in operation in a number of children upon whom I would have operated immediately; and in my early experience I watched these children with considerable perturbation as, after they were over their shock, they would be markedly distended for several days. As their rigidity diminished, we were often able to detect the presence of retroperitoneal hemorrhage which had evidently stimulated the sympathetic and comatic nervous system to create intestinal stasis. I saw a fairly large number of these children on whom at no time was it necessary to operate, and their convalescences were usually eventful after the first week.

This is not true of children who may be coatsing and hit a sharp object, as a fence post, and receive a ruptured intestine.

Non-Penetrating Injuries of the Abdomen

DIAPHRAGM: Rupture of the diaphragm is an often overlooked lesion which occurs from the result of an injury creating increased intraabdominal pressure.

Gatch states that he has operated on six such patients in the last two years and knows of two other cases discovered at autopsy. In all of these cases the tear in the diaphragm extended outward and slightly backward from the esophageal hiatus. All of the patients were injured in automobile accidents. The tear is evidently caused by the sudden great increase in intraabdominal pressure due to forward flexion of the body when the diaphragm and muscles of the abdominal wall are strongly contracted. He emphasizes the fact that it is often overlooked.

SPLEEN: Inspection may reveal swelling or absence of respiratory motion in the left upper quadrant. On palpation, tenderness and a sense of fullness can frequently be detected, and on percussion gastric tympany will be obliterated and a dull note heard on the lower chest posteriorly and in the axilla. As an aid in diagnosis in splenic injuries, Max Saegesser (Berne) advises use of the left splenic point, pressure being made between sternomastoid and scalenus anticus muscles. In all of these injuries seen by him, pressure here started up violent pain, contrasting with the same pressure on the right side. The reason is that sensory branches from the capsule run in the trunk of the left phrenic. This sign is present even when rupture is incomplete; and when there is a subcapsular hematoma with capsule intact, Saegesser believes this sign alone justifies splenectomy.

The flat x-ray as previously described will also be an aid in diagnosis.

A rupture of the spleen may occur with minimum external causes. The immediate hemorrhage may be profuse and may have to be operated on immediately. The danger, however, from splenic ruptures may be due to delayed hemorrhage. McIndoe, in 1932, collected and carefully reviewed 40 cases of secondary hemorrhage following injuries to the spleen. Gardiner in 1935 reported an additional case and remarked that there were fewer than 50 such cases in the literature, and since that time there have been only rare further case reports.

Despite the obvious infrequency of delayed hemorrhage, a thorough appreciation of its significance and a suspicion of its possible presence must be constantly borne in mind, because the secondary hemorrhage is frequently so rapid in its onset and so copious in amount that surgery is unavailing. In support of this we find that McIndoe in his review states that there were seven patients who died of secondary hemorrhage before operative treatment could be attempted.

I had a recent similar experience of my own. A man at the Kings Park State Hospital was injured in a tussle with his room-mate. He had some bruise marks over the ribs on the left side. The evening of the injury he complained of pain in his left upper quadrant, but was not very sick. He was up and about for three days, when, without further signs of injury, he went into sudden collapse and was transported to the hospital. On admission he showed marked signs of hemorrhage, had tenderness over his left costal margin, with an indefinite sense of mass. Because of his serious condition no x-rays were taken and he was transported immediately to the operating room. At operation there was much free fresh blood in the peritoneal cavity and the whole left upper quadrant was filled with old clots held in place by the omentum, which was greatly thickened. It was difficult at first to find the spleen, because the omentum and the blood clots were very deceptive. Before starting the operation it was decided that autotransfusion would be advisable and we were able at the start to cup out large amounts of blood, which were filtered through layers of gauze into a sodium citrate solution. This blood was immediately transfused. We were also able to wring out our layarotomy pads in a similar manner and collect more blood. Autotransfusion in spleen injuries is sometimes a life-saving measure.

LIVER: Lacerations of the liver are often better treated by delay in operation, as clots may form and seal over the injury. If, however, the hemorrhage persists and operation is necessary, tamponage is usually the procedure of choice. Large catgut sutures inserted by a blunt needle as mattress sutures may control the bleeding if tamponage is unsuccessful. As it is a well-known fact that muscle tends to stop bleeding, either free muscle transplants may be used, or, if there is one fairly large laceration, it is possible that one might use a pedicle flap from the rectus muscle. One must appreciate that any sutures inserted into the liver must be inserted just tightly enough to secure apposition and yet not tightly enough to cut through liver tissues in the ensuing postoperative edema.

STOMACH: Traumatic rupture of the stomach

without penetrating wounds is extremely rare without antecedent ulcer. Therefore, discussion is unnecessary.

Duodenum: Esselstyn has prepared for me an unpublished case of duodenal rupture, and I am indebted to him for the following review of the literature. He says: "Rupture of the retroperitoneal portion of the duodenum is not an uncommon injury. Rupture of the duodenum itself occurs in 10% of all ruptures of the hollow viscus. Rupture of the retroperitoneal portion of the duodenum occurs in 30-35% of this group. The accepted mortaligy is 90%. The literature is relatively meagre. More publicity should be given to this lesion because in the reported cases roughly one-third of these were missed at exploratory laparotomy in spite of the fact that exploratory laparotomy was carried out because of suspected ruptured hollow viscus."

Etiology

BLUNT, non-penetrating force is the usual cause. This may act in any one of several ways:

"It may cause a direct pressure against the duodenum on the underlying, hard vertebral column; or it may act on afferent and efferent loops of the duodenum causing a closed loop in which the pressure is suddenly raised to the point of perforation; or it may cause a tear at the junction of the free and fixed portion."

"The success of the operation, as in intraperitoneal perforation, is directly proportional to the length of time elapsed between the accident and the time of repair. Because the signs are more apt to be delayed in retroperitoneal damage, more careful examination is indicated. Sperling and Rigler have demonstrated the value of retroperitoneal emphysema as shown by x-ray. Butler, and Carlson, have pointed out that pain in the testicles is a symptom of retroperitoneal traumatic rupture of the duodenum due to irritation of the sympathetic nerves. Upon making the incision, the presence of gas between the peritoneum and transversalis fascia is suggestive, and retroperitoneal crepitation is almost pathognomic once the abdomen has been opened. W. H. Harris feels that pressure on the abdomen transmitted through the retroperitoneal tissue causes pain in the posterior part of the neck. He believes that any case of epigastric blow followed by hypogastric pain in which the pain persists and the pulse rate increases should be suspected of suffering from a rupture of the retroperitoneal portion of the duodenum.

"The findings at operation vary according to the size of the lesion and the associated injury. A certain number have effusion into the base of the transverse mesocolon which is bloody and bile-stained. Effusion into the abdomen is found in a great number of cases both of blood and intestinal content, where there has been an associated rupture of an adjacent portion of peritoneum. In cases explored late, retroperitoneal abscess is the rule."

Treatment

SIMPLE closure of small perforations is the treatment of choice. In complete tears proximal to the papilla, closure of the end and a posterior gastroenterostomy has been recommended. In treatment in lesions distal to the papilla, an attempted closure is considered necessary."

Results

NINETY per cent mortality: The chief causes of death are: (1) delay in operation, (2) duodenal fistulae, and (3) retroperitoneal phlegmon."

Esselstyn continues: "In our own case, a boy had a 1 cm. rupture of the retroperitoneal portion just proximal to the papilla. Upon opening the peritoneal cavity the striking feature was a retroperitoneal bile-stained emphysema of the transverse mesocolon. The duodenum was reflected medially, the perforation sutured, and the duodenum mobilized so that closure could be brought down on top of the peritoneum. The large omentum was swung up and sutured around the transplanted duodenum. Large retroperitoneal drainage tract was established through a lumbar incision and the abdomen was closed without drainage.

A duodenal bucket I believe was the important part of the postoperative care.

"Because the three most important causes of death are (1) delay in diagnosis; (2) duodenal fistula, and (3) retroperitoneal phlegmon, it is recommended in suspected cases that a small amount of barium administered either by mouth or by duodenal bucket could be used to differentiate the case from a retroperitoneal hematoma. I believe the duodenal fistula can be obviated in a large number of cases by effecting an intraperitoneal closure of an extraperitoneal rupture by immobilization and the judicious use of omentum. The retroperitoneal phlegmon can be definitely obviated by radical retroperitoneal drainage preferably through a lumbar approach."

Often a duodenal fistula may result following even the best of surgery. If the fistula is complete, the loss of gastric and biliary secretion, and the digestion of the abdominal wound, tries the surgeon's ingenuity to the utmost. Here the Miller-Abbott tube may be used as a life-saving measure.

All of us recognize the difficulty of inserting a catheter into the small intestine for feeding purposes, because the catheter twists on itself, and when nourishment is inserted it will regurgitate back into the wound. If, however, a Miller-Abbott tube be entered into the distal portion of the fistula and the balloon blown up, peristalsis will carry the tube down two or three feet, and feeding may then be carried out with ease. If we can collect the biliary secretions coming from the proximal loop and replace them, in addition to high caloric food, into the distal loop through the Miller-Abbott tube, we can often keep a patient alive where otherwise he would die of starvation.

In a recent case on my own service, following exteriorization for a high jejunal gangrene, we

utilized the Miller-Abbott tube for feeding, with success, for several weeks.

In the treatment of the skin and surrounding tissues aluminum paste or aluminum powder serve best to prevent skin digestion. Also I have found it useful to place meat balls over the wound so that the pancreatic juice may be neutralized before it can digest the patient's wound.

SMALL INTESTINE: Lesions of the small intestines due to external trauma are caused by either compression of the intestine as it passes over the spine, or sudden gas compression when the abdomen is hit with a blunt body with considerable force. Treatment of these lesions, of course, is operation after the control of early shock. It has been shown experimentally that small intestine will live if three inches of mesentery are stripped from its surface; beyond three inches, necrosis is apt to occur. If the lesion is large and very little soiling has been done and operation is performed shortly after injury, resection and anastomosis or primary closure of the perforation is the best procedure, with an accompanying proximal enterostomy to relieve gas distension. If, however, there is extensive soiling, exteriorization after the method of Rankin is the procedure of choice, with later closure of enterostomy. Here again the Miller-Abbott tube may be utilized for feeding purposes if inserted into the distal loop.

COLON AND RECTUM: Colon and rectum may be treated as other lesions, save where the lesion becomes retroperitoneal. In such case wide posterior drainage is necessary, often with the use of the Mikulicz' drain.

Rankin and Graham state that the injury by impalement is often more common than other types of injury and is noted with greater frequency in rural districts. The impaling object may, besides inflicting injury to the rectum, penetrate the vagina, urethra, bladder, or less frequently the colon or other abdominal viscera. The prognosis is more favorable than would be supposed. There was a mortality of 34.5% in a series of 58 cases reported by Van Hook, yet in 30 cases in which the injury was limited to the extraperitoneal portion of the rectum, there were no fatalities; in the remaining cases, 20 patients died (71.4%). Hemorrhage and peritonitis are the principal dangers. A relatively slight injury may be overlooked or disregarded; the patient will die of hemorrhage, although there has been no bleeding from the rectum. Careful examination is therefore essential.

Suture of rents in the rectum, below the reflexion of the peritoneum onto the rectum, probably seldom is advisable; they will usually heal spontaneously. Free drainage, however, should be instituted and in order to insure this it may be found necessary to divide the sphincter muscle. Fragments of wood or pieces of clothing (frequently carried ahead by the impaling object) should be sought for and removed. A reasonable suspicion that the peritoneum has been penetrated demands immediate abdominal exploration through an ample low median line incision. Delay until symptoms of infection develop, in instances of peritoneal penetration by the impaling object, usually results in a fatal peritonitis. A small wound in the colon may be readily closed by meticulous approximation of the edges of the wound. The sigmoid colon is most frequently involved in such injuries, and this is fortunate, because the fecal content in this portion of the bowel is ordinarily formed; therefore the possibility of gross soiling is less than for other segments.

I have found that if a rectal tube be passed into the colon before the beginning of operation, and then, after the closure of the perforation, if it be passed upward well into the descending colon, by guidance of the base within the abdomen, it acts as a gas decompressor. Small irrigations may be made through it which will supply fluids and will assure the surgeon that the exit of the tube is not clogged with fecal matter. When a great deal of tissue has been destroyed the wound in the bowel cannot be easily or safely repaired. In such cases one should always consider the advisability of temporary colostomy, either of the sigmoid or transverse colon, in addition to suture of the rents in the colon, and permit subsequent developments to determine the future course. If later proctoscopic examination reveals a lumen sufficiently patent at the site of injury, then the colonic stoma may be closed. Drainage of the pelvis will be indicated in every instance of extensive destruction of tissue, since the likelihood of the suture line to fail will be considerable. Such repairs have been reported, and subsequently at necropsy, wounds of the small bowel or bladder have been found. It is, therefore, highly important to keep such possibilities in mind.

PENETRATING WOUNDS OF THE ABDOMEN: The figures of almost all writers who have analyzed their mortalities from penetrating wounds are very similar. It is interesting to note that the mortality from stab wounds is about half that from bullet wounds. The mortality of stab wounds is about 30% while that from bullet wounds is about 60%. It is also interesting to note that stab wounds of considerable size very often recover. Boland and MacGowan, in their separate series, each note stab wounds with eventration of stomach, colon and small intestines that have recovered. When one realizes that these stab wounds occur in people with dirty skins, and often through dirty clothing, that the patient has always to be transported to a hospital and that a lapse of time after they arrive in the hospital must usually be at least one hour before operation is started, one is impressed with the resistant power of the peritoneum as long as it is not contaminated by fecal matter.

Eighty percent of the total deaths in the MacGowan series was either due to hemorrhage or suppurative peritonitis. Hemorrhage occurred in 12 cases and suppurative peritonitis in five. Nine cases died within 24 hours, five within the first week, and seven others ranged from 13 to 43 days. Of his surviving cases, it is interesting to note that the average time between injury and exploration

was 3.6 hours, which is a shorter time than will occur in many hospitals. All authors in emphasizing the mortality figures of gunshot wounds stress the frequency in multiple injuries, of overlooking other injuries. In the MacGowan series 15 cases of visceral injuries had been overlooked at the time of operation. Billings and Walkling, in their survey, reported 55 gunshot operative deaths, with autopsy examination in 49 cases. They found nine instances in which visceral injuries of one kind or another had been overlooked at the time of operation. MacGowan, in an analysis of his cases, makes the following recommendations: Technical procedures in our surgical repair should be comprehensive but as simplified as possible. Multiple enterorrhaphy is preferable to resection with proximal enterostomy as an aid when repair has been difficult. Extensive lacerations of the large intestines may be speedily handled by exteriorizing the injured portion. Injuries to the duodenum and pancreas should be thoroughly visualized, the duodenum should be mobilized, the perforations closed, and the adjacent retroperitoneal space drained. This is most important in pancreatic injuries where wide drainage is essential. In pancreatic injuries, silk sutures should be used in preference to catgut. The significance of the posterior perforation accompanying the anterior perforation in a peritonealized hollow viscus is generally appreciated, but in the fixed portion of the large intestine, and especially the rectum, it is of great importance. Posterior closing of the ascending and descending colon demand immobilization of the injured portion, careful closure of the perforation, and wide drainage of the adjacent retroperitoneal space. Injuries to the rectum, in addition to the intraperitoneal repair, demand excision of the coccyx and exploration of the retroperitoneal space, with closure of the posterior wall perforation and the institution of wide drainage to the retro-rectal space. At times it is advisable to cut the rectal sphincter muscle to prevent back pressure of gas and feces.

In discussing penetrating wounds, considerable importance should be placed upon the work of Byrd Willis in analyzing gunshot wounds of the abdomen. Willis says: "It might be well first to review the mechanics of shot gun wounds. At any range, the pattern is modified by the length of barrel and by its choked or open state. The longer the barrel and the more choked the bore, the more concentrated is the pattern made by a given load. Unless the muzzle is at close range, 2 feet, the load makes a ragged hole, carrying cloth, wads and tissue into the body and destroying everything in its path until its force is spent. At less than 2 feet, it makes a round hole, carrying in wads and shreds of clothing, and may explode intestine at some distance from entrance, as in one of our cases. Most of these victims will die within 24 hours, regardless of treatment.

"Without changes of range or load, the degree of penetration is determined by the size of shot and by the number of wads between it and powder. Another modifying factor is the amount of shot to quantity and quality of powder. Lead shot will flatten upon the object it meets and make a much more ragged wound than does the modern, and now almost universally used, chilled shot, which retains its outline unless it strikes a hard substance, and, therefore, has greater penetrating power. The negro and some tenant farmers commonly use a No. 6 shot for all kinds of game; sportsmen vary their shot to suit game and season. Therefore, the type of hunter should be learned, as well as the range and type of gun.

"If the abdomen of a person whose wounds are scattered is operated upon within a few hours after the receipt of injury, there will usually be found a small amount of odorless fluid slightly tinged with blood, but no contamination from the intestines is seen. Of course if some vessel has been punctured there will be moderate hemorrhage. In some cases, no doubt, severe hemorrhage will be present where a direct hit of some artery has been made. On examination of the gut, small hemorrhagic dots and dashes will be seen, representing perforations at right angles and on slant; subserous hemorrhage is sometimes found in the bowel wall, and frank hemorrhage in the mesentery. It is remarkable that there is not more hemorrhage in the great majority of cases. The hemorrhage in the mesentery, unless preceding from some wound of the aorta or of other large artery will take care of itself.

"One shot may make 10 or 12 perforations of the small bowel; if many birdshot enter the abdomen and penetrate the intestines these perforations may be legion. Since the intestines with small wounds unlike bullet wounds show no pouching of mucosa, there is danger of milking the germs through them and inducing peritonitis by handling. One cannot find every perforation without doing serious damage while looking for them."

Willis includes all shotgun wounds in the abdomen or involving abdominal contents treated at Park View Hospital by Dr. E. S. Boice and himself since 1914. They are grouped: (1) as massive wounds made at close range, whole loads and wads carried into the body en masse, and (2) those with scattered perforations by separate shot, the gun at some distance, usually beyond 10 feet.

In this series there were 13 massively wounded. Nine of this group died, eight of them within 24 hours; the other lived 48 hours. Of the four that lived, two were operated upon and two were treated expectantly. Of the nine that died, six had some operative treatment. Three were so hopeless that nothing could be done. Only two in this class were treated expectantly.

There were 10 of the scattered type. Seven were treated expectantly and six survived. The seventh developed intestinal obstruction about the tenth day, when an enterostomy was done, and died four days later. This really was a borderline case, for it was recovered from beneath the skin, and he had gangrene of the left scrotum, testicle and cord. He was supposed to have been shot with No. 4's at about 10 feet.

Willis analyzes his treatment as follows: Treat-

ment. This treatment is rarely to be used for the massively wounded, but is urged for scattered abdominal wounds. Briefly, it is as follows: All points of entrance to be surgically cleaned and properly dressed. Prophylactic doses of antitetanic and perfrigens serum, sufficient opiate to depress respiration to 12 or 14 per minute, nothing by mouth, phleboclysis of dextrose 1000 cc., 5% tid, or Herndon's continuous phleboclysis, repeating antitetanic on fifth day and continuing oral starvation six or ten days, depending upon condition of patient and size of shot. Should more fluid be desirable, hypodermoclysis or intravenous injection can be used. None of the surviving cases developed a serious hemorrhage or abscess, but they may occur; therefore, the patient should be carefully watched and the abdomen examined from time to time. Enemas should not be given for fear fluid may be forced through the perforations.

I had an opportunity two years ago of profiting by the experiences of Willis. At the Kings Park State Hospital a patient was stabbed eight times in the lower right quadrant of the abdomen with a sharp-pointed ice pick. It seemed to me that the ice pick injuries very closely resemble shotgun injuries, and the patient was placed on an Ochsner regime and carefully watched as to blood count and blood pressure. He ran an elevated temperature for a week, with signs of some moderate rigidity and tenderness in the right lower abdomen; then his tenderness and rigidity gradually subsided and his temperature became normal. The patient was discharged back to quarters in two weeks, and in the two years following this time he has not presented any abdominal symptoms.

Conclusions

IN *non-penetrating* abdominal wounds it is imperative to diagnose, if possible, between shock and hemorrhage. New laboratory tests are placed at our disposal which will greatly help this difficult problem. Lives may be saved by knowing when to operate if surgical intervention is necessary.

2. In *penetrating* abdominal wounds the initial treatment of shock may be carried on in the operating room just antecedent to and concomitant with operation. One must remember that infection and hemorrhage continue during shock treatment. If one attempts to bring the blood pressure to normal in the ward, the later transportation to the operating room and the shock of operation make the secondary treatment of shock more difficult.

Discussion:

DR. CHESTER C. GUY, Chicago: This excellent paper by DR. BANCROFT has been so comprehensive and he has brought up so many interesting subjects that it is difficult to know just which ones to which to limit the discussion.

We have all had these problems of the acute traumatized abdomen to deal with, and those he has mentioned are familiar to all of us. I was glad to hear him open his paper with a discussion on the newer work with the blood specific gravity determinations. Our progress in surgery for many years was dependent upon the anatomist and the pathologist; now I think the trend is more toward the physiologist. This newer work in blood specific gravity is a good example of that. Certainly the differential diagnosis between shock and hemorrhage, at least in the early stages, is often one of extreme difficulty, and our old methods of trying to distinguish between the two are too often either of no avail or are actually confusing.

DR. BANCROFT mentions the changes in the blood as they occur in shock. Blood pressure recordings are often of no help as the pressure may drop. At present we are pursuing some studies at Cook County Hospital on blood specific gravity and have even started some work on trying to control shock by the use of spinal anesthesia. In a small group of selected cases, we have not progressed far enough yet to be able to draw any conclusions; but I think it may be that in some of these abdominal injuries the use of a spinal anesthetic may be of value, not only in controlling pain and overcoming shock, but to a certain extent, in helping us in our diagnosis and perhaps preparing the patient for surgery. I think anyone who has had an opportunity to follow any of these injury cases to autopsy has some definite conclusions fixed in his mind.

I was glad to hear DR. BANCROFT speak of the overlooked lesions. I have no doubt but that the majority of the lesions which are overlooked are in the upper abdomen. Retroperitoneal lacerations of the duodenum are not rare, and too often they are overlooked because the surgeon does not inspect the tissues for evidence of edema or emphysema. Too often at autopsy you see a bullet hole in the front wall carefully sutured, and the one in the posterior wall has not been touched. The excuse may be that it was difficult or impossible to get to the posterior wall.

Injuries to the pancreas are of extreme importance, and the case of President McKinley is one of the best known. His death resulted from a pancreatic injury which was not recognized and consequently was not properly drained.

DR. BANCROFT also spoke of the secondary hemorrhages of the spleen. I am interested in the subject and reviewed all of the cases I could find. I think the majority of these cases can be recognized if the surgeon bears in mind the possibility of the injury. One man was struck by an automobile when he was carrying a book under his arm. A bruise of his left lower chest was overlooked, and he died of a secondary hemorrhage of the ruptured spleen which had not been recognized at first.

As to ruptured liver, I have been interested in this because I have still to convince myself that there are any cases of ruptured liver in which the element of hemorrhage is greatly aided by surgery. Those cases of ruptured liver in which the rupture is small will get well spontaneously as far as the hemorrhage is concerned. When severe, I doubt if the surgeon is successful in control in very many cases. A peritonitis may result and the patients almost invariably die, either from peritonitis or because adequate drainage of the bile is not allotted for.

DR. BANCROFT spoke of the question of packing to control hemorrhage. At autopsy we occasionally see a rupture of the liver where an attempt had been made to control the hemorrhage by packing; and I doubt very much if packing alone will very satisfactorily control hemorrhage from the liver or ruptured spleen.

DR. BANCROFT mentioned facetiously the type of gun used in certain gunshot wounds. That information may be of value. Too often we do not consider the type of patient we have to deal with in an injury case and time and again we see a case where there is a fractured femur, skull fracture, etc., that are recognized and treated, and two or three days after the injury the surgeon says the patient has developed a peritonitis, and, it is found at autopsy that he has some other intra-abdominal injury which was overlooked. Many of these cases need careful study of their abdomen in addition to whatever other injuries may be present.

I think this is an excellent presentation. I enjoyed hearing it, and I am glad to have had the opportunity to discuss it.

DR. WILLIAM R. CUBBINS, Chicago: I cannot say how much I have enjoyed both DR. BANCROFT's paper and DR. GUY's discussion. This talk here tonight has just about educated me, and I thought I knew quite a little bit about abdominal injuries. I really mean it when I say that I enjoyed this paper tremendously.

In regard to the cystogram diagnosis of ruptured bladders, I do not believe that it is frequently necessary, because in the individual with an injury in the belly there is a marked increase in the intra-abdominal tension; and if you have a retroperitoneal rupture the roof of the bladder is crushed down so that no fluid will accumulate in that bladder. To catheterize him on admission, and then catheterize him an hour later is a very valuable thing and can save the introduction of air or any irritant fluid into the belly. Of course Roger Vaughn takes a great joke in stating that if you have a ruptured bladder and put air in the bladder it certainly cannot do any more harm than the air that goes into a laparotomy wound. The idea of laparotomy being dangerous is just absurd. On the other hand, where used, it is not uncommon to encounter multiple air where the veins are not closed over with sutures. It is a very different thing from a surgical operation, and that should be impressed upon people.

The section in relation to the ruptured spleen was intensely interesting, particularly with reference to the elevation of the diaphragm. In our wards we are very much limited by the coroner's physicians who look at the patients and say they are dead, and it isn't very much use of looking any further. There is too much superficiality in the study of these injured people. These ruptured spleens with multiple fractured ribs is what I had hoped DR. BANCROFT would speak about, and his address with relation to shock is exceedingly interesting. But, it is almost impossible to have multiple rib fractures either on the right or left side without a greater or less degree of injury both to the spleen and liver, and in many instances, to the kidney. As far as acute hemorrhage in these cases where it has been necessary to operate, we have not encountered a single one. We have been forced to attempt an operation for a secondary injury to the spleen, but you see, I am handicapped in what I am stating by the inability to get pathological reports unless I follow it out. I have to do it in order to get it, and these things handicap my discussion very seriously.

I wanted to discuss this treatment of duodenal fistula. One time when I was working with Johnny Long and Bob Keeton, they wanted me to make a duodenal fistula to keep a dog alive. To get that fistula through and try to sew the tube in is almost impossible to do, and I just failed. Keeton came along, folded the pad up, and pushed it in there folded. Then he retracted the tube so that the fistula drained and kept the dog alive in that manner. I had a very important gentleman not long ago with a common duct stone and who promptly developed a duodenal fistula. So, we took a large multiple pack, passed it into the tube, retracted it gently, and stopped all discharge. That is Keeton's method and I do not want to claim any of his work. It will work in a moderate sized opening.

Now, we come to the question of overlooking visceral injuries. You know when you are confronted with the question of overlooked perforation, it is a very delicate thing to say the least. I have been in that position many times, and it is a very difficult thing to do. You get into a certain spot where you find a number of perforations and a certain degree of spilling. If that spilling is high up in the jejunum you have relatively a greater safety than if it is in the lower portion of the ileum. Each time you spread over into a different fold of the peritoneum and mesentery, you markedly increase the danger. When you have perforations of the large bowel by a gun shot and a spilling of the feces, a complete surgery of that peritoneal cavity, I think, would result fatally in such a large proportion of cases that it would hardly be advisable.

I understood that President McKinley died of the bacillus arogenes capsulatus. There was a woman one day in the County Hospital who had been shot through the abdomen. They found and closed the wounds in the stomach, and Elizabeth died of a foamy liver 14 days after the operation. I was intensely interested in that and so I rather followed up this case of President McKinley and it is my thought that he died of the bacillus arogenes capsulatus.

As far as tenderness and rigidity of the abdomen, DR. BANCROFT did not deal with that at all. That is something which has troubled us because with fractured pelvis it is an extremely difficult thing.

In relation to distention of the bowels in these cases of perforation, we have had several cases in which the obstruction has been due to simply fat emboli.

There is one thing else I would like to mention in relation to these extensive chest wounds with abdominal injuries. We have found that we are forced to give enormous amounts of morphine. We have to strap that chest with morphine and take the chance of overlooking a rigid belly, or else he won't live long enough to have a rigid belly.

Fractures across the sternum and multiple fracture of the ribs can and do kill, and they kill from shock in a manner that is shocking.

DR. WILLIAM O. SHERMAN, M.D., Chicago, I hope that the work of DRS. SCUDDER and DREW will stand up to the acid test. I have to admit that I have been troubled in knowing just what to do and what not to do. When we get to the point where we don't know what to do, we just don't do anything. My first introduction to an acute traumatic abdomen was in the spring of 1902 when the Wabash was extending its railroad in Pittsburg. We received a call to the laborer's camp where a kindly friend of this negro told us he had just done a lovely piece of razor work, which extended at least 10 to 11 inches down to the recti. When I got there, he had three or four feet of bowel laying out and covered with straw which was on the floor. Well, I didn't know what to do, so I put a towel around him and got him to the hospital as quickly as I could. There the surgeon put a few stitches here and there and the negro promptly got well.

A few years ago, a certain coroner had received word of the sudden death of one of the workers at the steel mills, and the doctor had made a diagnosis of having died from drinking cold water. He went out to the cemetery and dug up this patient and found that he had a rent in the rectum approximately the size of a half dollar. What really happened was that in a spirit of fun one of the fellow workmen had taken a compressed air pump and was dusting him off. This compressed air ruptured through the rectum, and of course he died from peritonitis.

I have never seen a rupture of the duodenum due to trauma; nor have I ever seen a traumatic appendix. However, in the last three months we encountered an individual who had suddenly thrown his arms back and had evidently strained some of the retroperitoneal tissues. We were in doubt as to whether he had an appendix or not, although I am inclined to believe he had a retroperitoneal rupture at that time.

I have never had an opportunity to see any of these cases of bird shot wounds that DR. BANCROFT described, but I think that it is perfectly logical, and I think we will all benefit from the report of these cases. And, if this work of Scudder and Drew stands up to the test, I believe we will be able to make earlier and more accurate diagnoses than we have before.

I enjoyed DR. BANCROFT's paper and I am sure that he realizes that he couldn't possibly cover the entire subject in one paper.

DR. FREDERIC W. BANCROFT, (Closing): I wish to thank everybody for their kind discussion, and I realized when I started out that I could not cover all of the ground. When I signed up for this subject, I did not know what a big subject I really had, and I apologize to some of you for making it too long or too boring.

I tried to meet the things that seemed to me the most important. I agree about the liver. I think many of

these livers will heal if left alone; and I think if it is between the diaphragm and the liver, probably trying to expose the liver is more harmful than the trauma itself. I would like to find a case where I could use the free rectus muscle graft. I think it can be done, although I have never tried it. With liver injuries you are pretty apt to get a mortality, and I think you do have to try some of these things.

I agree about the overlooked abdominal injuries. When you are told, "I think the blood pressure is falling," and, "Doctor, this case is not going to last very long," I think that is often the excuse for overlooking some of them.

I was glad that DR. SHERMAN brought up the subject of compressed air. It only has to be in the neighborhood of the anus to cause some of these ruptures. I did see one article fairly recently about compressed air, but about that time I was getting down around the 23rd page, so I thought I would leave it out.

Criteria of Cure

—*In Occupational Diseases*—

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FOR some time I have had the feeling that the subject of criteria of cure in occupational diseases has not received the attention which it deserves. This neglect may be due in part to the fact that present day medical education places great stress on diagnosis and pays some attention to treatment but takes for granted that if diagnosis is correct and if treatment is adequate cure will naturally follow. In the field of industrial medicine no such complacent attitude can be permitted to prevail. The health and welfare of the employee as well as responsibilities of the employer make it imperative that the establishment of the fact of a cure rest on a firm foundation. Very often it is just as important to know when a worker is well as it is to know when he is sick.

The title of this paper is merely another way of saying: "When is a case of occupational disease cured?" No doubt there are some who feel that the answer to this question is: "Never." As a matter of fact the protracted and seemingly endless cases are relatively few in number; nevertheless they are a source of considerable worry and annoyance to insurance companies. Later on I shall make some suggestions which may be helpful in preventing the occurrence of perennial cases.

Criteria of Diagnosis

BEFORE going into the matter of cure we must spend a few moments considering the question of diagnosis, inasmuch as the criteria for diagnosis and cure have much in common. The final decision, from the legal point of view, as to whether or not a workman is suffering from an occupational disease is frequently made by a non-medical compensation referee. Actually the referee does not make diagnoses, but his ruling on the compensability of a claim is tantamount to deciding, at least officially, whether or not a claimant's illness is occupational in origin. The referee is usually familiar with industrial processes and hazards as well as with the ordinary signs and symptoms of the more common occupational diseases. To assist him in arriving at a decision he receives physicians' reports, hears medical testimony and is given the results of various laboratory tests. Unfortunately the physicians' reports are frequently incomplete and are colored by personal sympathy rather than by scientific reasoning. Medical testimony is all too often conflicting, confusing, incompetent and prejudiced. Consequently the laboratory reports play a major role in guiding the referee. Anyone familiar with the subject is well aware of the pitfalls and difficulties which surround the interpretation of laboratory analyses and no scientifically minded physician will venture a diagnosis on the basis of laboratory reports alone. It is true that the blood count, the urinalysis, the patch test and the x-ray all may produce valuable evidence, but without a full occupational and medical history and without a careful physical examination proper diagnosis is difficult or impossible.

What is Meant by "Cure"?

FOR our purposes we can define the term "cure" as a return to a state as near as possible to that which existed before an illness. There are certain non-occupational diseases such as diphtheria and typhoid fever which are followed by a state of immunity. If the patient survives he may be better off than he was before his illness since he is protected, often for life, against subsequent attacks of the same disease. Pneumonia and rheumatic fever, on the other hand, seem to render their victims more vulnerable to future attacks of the same disease. Diseases such as diabetes and arteriosclerosis when once established remain for life.

The type of classification applied to non-occupational illness may also be applied to occupational diseases. Anthrax usually confers lifelong immunity. One attack of the allergic type of dermatosis predisposes to another. Silicosis when once established is there to stay.

Practical Problems

I HAVE laid down these few fundamental concepts to serve as a background against which the practical problems involved in establishing the fact of a cure can be considered. It is necessary to understand something about the nature of disease and its effect on the living organism in order to know what to expect or hope for in the way of a cure. At this point I should like to restate my definition of cure as a return to a state as near as *possible* to that which existed before the illness. An important point to keep in mind is that we should not expect or be expected to do the impossible. In many cases we must not hope to bring about a complete status quo ante, nor should we be expected to restore a sick worker to a state *better* than that which existed before his illness.

Delivered before the Greater New York Safety Conference, April 18, 1940.

I shall make no attempt to discuss all of the occupational diseases in which problems in criteria for cure might arise but will say a few words about some of the conditions which are most frequently encountered.

Dermatoses

INDUSTRIAL skin disorders may for purposes of simplicity be divided into two main classes: the local or irritative type and the systemic or allergic type. In the former, the skin eruption is locallized to exposed parts (usually the hands and forearms) and is due to the action of a chemical irritant. Cases of this type usually clear up promptly on cessation of exposure to the irritant and cure is complete. After an attack the victim is no more nor less susceptible to subsequent attacks, but will develop a recurrence if exposure is renewed. To remain well requires only avoidance of extensive contact with irritants. The natural history of the allergic type of dermatosis is quite different. The rash as a rule is not locallized to points of contact, but may involve the entire body. Although the eruption will clear up on removal from exposure, the individual has become sensitized so that subsequent contact with even the most minute quantity of the original irritant may precipitate an extensive outbreak. In cases of this nature one should not expect a return to the original unsensitized state. The nearest possible approach to the original condition would be disappearance of the skin eruption maintained by scrupulous avoidance of contact with the offending agent. It is possible that in the future, methods of desensitizing such individuals will be developed.

Heavy Metals

AMONG the metallic poisons most frequently encountered in industry may be mentioned lead, arsenic and mercury. Each metal causes its own peculiar type of illness and in each case cure must be evaluated according to different sets of criteria.

LEAD. This metal seems to be responsible for more reported cases of industrial poisoning than any of the others and probably leads the list of "problem children" when it comes to deciding when an individual is cured. The diagnosis of lead poisoning is usually based on a history of exposure to lead, the presence of certain well recognized symptoms and physical findings and particularly on the finding of stippled cells in the blood and more than a certain arbitrary amount of lead in the urine or blood. Under suitable treatment it is possible to cause all or most of the abnormalities to disappear within a day or two. I think that there are very few physicians who would claim that this disappearance of abnormal findings constitutes a cure. As long as an individual has a dangerous amount of lead stored in his bones he cannot be considered to have been restored to a state as near as possible to that which existed before the illness. Under proper therapy, preferably carried out in a hospital, elimination of lead can be brought about. In my opinion, a case of lead poisoning should be considered cured when and only when systematic de-leading has been carried out and when further attempts to remove lead result in no increase in the urinary lead, in no reappearance of stippled cells and in no recurrence of the typical signs and symptoms of poisoning. I realize that this is not as simple as it may sound, but at least it provides a basis for judgment.

ARSENIC. The fact that arsenic is stored in the tissues of the body is probably not as widely known as is the fact of lead storage. Absorbed arsenic is deposited in practically every organ and tissue of the body, the main depots being the liver and kidneys. There is considerable evidence to show that the excretion of arsenic can be hastened by the administration of calcium or sodium thiosulphate. In considering cure following assenic poisoning the same principles that have been described for lead poisoning should be observed. After elimination treatment there should be no increase in urinary arsenic, and no recrudescence of signs or symptoms of poisoning.

MERCURY. Acute mercury poisoning is quite rare in industry and so will not be discussed. The criteria for cure in chronic mercurialism are relatively simple and are based upon the disappearance of the outstanding signs and symptoms of poisoning. As far as I know there is no special form of treatment which will hasten the elimination of absorbed mercury. Removal from exposure and general hygienic measures usually result in cessation of the tremors and in restitution of health. The time required for recovery depends upon the duration and intensity of exposure.

Benzol

IN discussing the criteria for cure following benzol poisoning I shall consider only the chronic form of poisoning. The criteria in this case are based almost entirely on the results of blood studies. It is well known that the blood picture is the cardinal diagnostic point in benzol intoxication, consequently cure can be evaluated on the same basis. Since the range of normal values for the various elements in the blood is pretty well established it is a fairly simple matter to decide when an individual has recovered from benzol poisoning. The matter is further simplified if a pre-employment blood count has been done. I might add at this point that recovery following severe chronic benzol poisoning may require several years.

My personal feeling is that the course and rapidity of the process is influenced little if at all by any special form of treatment. I might also add that it is not necessary for these protracted cases to remain away from work provided they are watched carefully and have no further exposure to benzol or other toxic chemicals.

I think it would be out of place for me to attempt to outline or suggest criteria for cure in every type of occupational disease. There are certain conditions such as silicosis and some of the occupational cancers in which the nearest we can

come to cure is to arrest the process or prevent complications.

What Can Be Done

I HAVE already mentioned in passing one procedure that can do more toward simplifying the question of evaluating cure than all other methods combined. I refer to the pre-employment examination. The purpose of this paper is not primarily to boost the idea of pre-employment examination, but I think it must be obvious that if one is trying to decide when a worker has been restored to a state as near as possible to that which existed before an illness there is a decided advantage in knowing just what the pre-existing state was.

There is a second suggestion which I should like to make and in making it I have the support of Mr. W. H. Cameron, managing director of the National Safety Council. In fact, I shall quote directly from a letter which Mr. Cameron was kind enough to write when I asked him for suggestions on the subject matter of my talk. I quote:

"Establishing the fact of a cure may depend to a large extent upon the cooperation of the patient. Management can do much to secure that cooperation by complete sincerity in dealing with victims of occupational diseases. There should be no attempt to dodge responsibility or minimize the seriousness of the illness. The employee should not feel that he is being blamed for the condition. He should be made to know that management wants him back on the job as a permanent employee just as soon as he is able to work and that if the nature of the disease makes it unwise for him to return to his old occupation an effort will be made to find other work for him. Management people should also cooperate with the physician to the limit in helping to rehabilitate the employee and this should include putting him on such work as he can handle in the position recommended. This all represents an attitude on the part of management and needs to permeate the management group in the organiaztion including foremen and supervisors."

A third procedure which I think would throw much light on the problem of criteria of cure would be a medical and statistical analysis of cases which have gone through an unduly long period of disability following an occupational illness. I feel confident that if such analyses were made it would become apparent that many of these cases had certain features in common. It seems very likely that a study of the protracted cases would bring to light certain facts which would guide those agencies charged with the responsibility of providing care for victims of occupational disease in their efforts to effect a cure in the shortest possible time.

I have made no attempt to cover more than a few phases of the subject of criteria of cure. It is my hope that some will be stimulated to give further active consideration to this important but neglected problem.

Ingestion of Phenol

—*Effects on the Albino Rat*—

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THE prolonged ingestion of considerable amounts of phenol by the rat apparently does not lead to chronic poisoning in this animal. This is indicated by the experiments of Heller and Pursell[1] who added phenol in varying concentrations to the drinking water of rats and found that even after three generations the animals were not appreciably affected by the presence of phenol in concentrations up to 5000 ppm. This low toxicity suggests that phenol is not stored in the animal body but instead is either excreted rapidly or detoxified. Tauber[2] noted in 1878 that the amount of "free" phenol excreted in the urine of the dog increased with size of the doses administered. He recovered up to 55% of the quantity ingested, as tribromophenol. Williams[3] studied the sulphate conjugation of phenol in the rabbit and found that the percentage of phenol conjugated with sulphate remained constant at about 20% after the ingestion of single doses ranging from 100 to 250 mgm/kg. This conjugation takes place, according to Becher and Litzner,[4] in the kidneys. Phenol is also excreted in conjugation with glycuronic acid, although accurate quantitative data as to the extent of this conjugation are lacking. Some portion of the phenol is oxidized. According to Baumann and Preusse[5] catechol and quinol are formed after the ingestion of large doses, and Williams[3] has reported the formation of oxidation products, such as certain complex quinonoid pigments which are probably produced through the action of phenolases. Becher and Litzner[4] are authority for the statement that the central nervous system is not affected until "free" phenol is present in the blood stream. It is of interest to note in this connection that Heller and Pursell[1] found only a slight elevation of the free phenols in the blood of rats given drinking water treated with 12 gm. of phenol per liter.

In a previous communication[6] the normal phenol content of rabbit tissues was reported as ranging from 0.09 to 0.51 mg. per 100 gm. of organ. The highest concentrations were found in the kidneys, and the lowest in fatty tissues. These results were concerned only with steam-volatile acidic compounds such as phenol, cresols, and possibly traces of pyruvic and higher fatty acids, which are estimated together as Fraction I in the method of Deichmann and Scott.[6] Formic and butyric acids may also be present but they do not react with p-nitroaniline and hence do not interfere, while the alkaline evaporation of the distillate removes acetone, ethyl alcohol, acetaldehyde and methyl glyoxal, which would react with this color reagent. In this method sodium tungstate and sulphuric acid are used as protein-precipitating reagents and the

From the Kettering Laboratory of Applied Physiology in the College of Medicine of the University of Cincinnati. Presented before the Division of Biological Chemistry at Cincinnati, Ohio, April 8-12, 1940.

unknown is compared in a colorimeter with a phenol standard prepared according to Folin and Denis.[7]

The observations here reported were carried out to determine whether or not prolonged ingestion of phenol would lead to a retention in the tissues of phenolic compounds of the type indicated above. Normal albino rats, both male and female, bred and reared in the laboratory, were divided into five test groups and one control, each consisting of 10 animals. All had free access to a diet of Purina Fox Chow, but their drinking water was treated with varying amounts of phenol. A record was kept of the weights and the consumption of phenol in water. The control rats received untreated tap water which contained only a very faint trace of phenol. The animals were kept under observation for a period of 12 months, were then stunned by a blow on the head and were killed by bleeding. The heart, lungs, liver, kidneys, spleen, and sufficient muscle to make a total sample of 20 gm. were removed quickly from each animal and were combined and analyzed as a whole with respect to the quantity of steam-volatile acidic compounds (Fraction I only). The entire gastro-intestinal tract and its contents were removed and analyzed separately.

TABLE 1

PHENOL INGESTED AND RETAINED BY ALBINO RATS OVER A PERIOD OF 12 MONTHS

Group	Conc. of Phenol added to drinking water gm/liter	Average Daily Vol. of phenol-water ingested per rat cc.	Average Amt. of phenol ingested daily per rat mg.	Phenol in in tissues of rats at the end of the experiment mg./100 gm. tissue
I	0.8	27	21	0.132 0.122 0.157 0.264 0.210
II	1.2	25	30	0.167 0.298 0.145 0.166 0.160
III	1.6	30	49	0.130 0.209 0.182 0.191
IV	2.0	28	56	0.203 0.227 0.188 0.178 0.143
V	2.4	23	55	0.183 0.172 0.184 0.172 0.188
Control	—	30	—	0.150 0.233 0.185 0.175 0.214 0.140 0.116

Results

TABLE 1 gives a summary of the average quantities, in milligrams, of phenol ingested, and the phenol found in the tissues of the animals. The quantities ingested daily ranged in the different groups from 21 to 56 mg., or from 7.7 to 20.4 gm. per rat per year. In order to compare these daily dosages with the single lethal dose, administered orally, the latter was determined. Doses ranging from 550 to 650 mg. per kilo body weight killed 50 to 60% of the animals in three to 90 minutes (Table 2). Thus the highest amount ingested in the chronic experiments was about 120 times the lethal dose administered orally at one time. The consumption of phenol-water fluctuated somewhat, being lowest in group V which was given water treated with 2.4 gm. of phenol per liter.

TABLE 2

SUMMARY OF RESULTS OF ORAL ADMINISTRATION OF A SINGLE DOSE OF PHENOL (5% AQUEOUS SOL.) TO ALBINO RATS

No. of Rats	Dose gm/kilo	Percent Mortality	Minutes till death
10	0.40	10	20
10	0.45	20	10 and 80
10	0.50	30	10 to 30
10	0.50	30	10 to 30
10	0.55	50	5 to 90
10	0.60	60	3 to 8
10	0.65	60	4 to 60
10	0.70	90	4 to 50

The analyses revealed practically no differences in the total phenol content of the tissues of test and control rats, the concentrations ranged from 0.12 to 0.23 mg. per 100 gm. of tissue in the control group, and in the five test groups, from 0.12 to 0.30 mg. The tissue and contents of the gastrointestinal tracts of the control rats contained from 0.23 to 0.49 mg. phenol per 100 gm. of tissue, while those of the test rats yielded from 0.32 to 0.70 mg. The weights of the rats were recorded and are summarized in Fig. 1. Rats which ingested 55 and 56

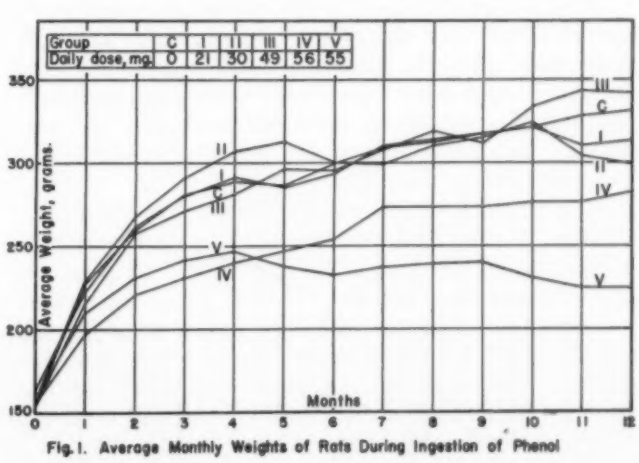

Fig. 1. Average Monthly Weights of Rats During Ingestion of Phenol

mg. of phenol daily showed the most marked retardation in growth.

Summary

ALBINO rats were given phenol in their drinking water for 12 months, in quantities up to 56 mg. per day. The heart, lungs, liver, kidneys, spleen and muscles of each rat were combined and analyzed as a single sample. The retention of phenol in these animals was insignificant. The daily oral dose of 56 mg. is approximately 30% of the single oral dose required to kill a large proportion of rats in a short time.

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Fatal Traumatic Pneumonia

—Case Due to Extrathoracic Trauma—

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THERE is considerable controversy in the literature relative to the causal relationship between trauma and pneumonia of various types. There is less disagreement in forms associated with thoracic trauma than those having an etiogenesis in distant injuries. In both cases when a connection between cause and effect is demonstrated liability is obvious.

It is generally admissible that a severe thoracic trauma may be followed by a morbid pulmonary succession. The immediate effects of violence and traces of thoracic trauma must be generally established, in order to obtain compensation.

Thoracic contusions, however, are not sufficient to determine the entity between trauma and the successive clinical status. Ecchymosis may be deeply seated and that even following insignificant contusions deep commotions, such as pulmonary lacerations, central or peripheral, silent or stormy may result.

Any trauma may reflexly affect the bulbar inhibitory centre and thus result in a vast paralytic dilatation of the lungs, through the vagus nerve, and subsequent destruction of their defensive mechanism. Factors of great importance in the adjudication of these cases are the age and the general condition of the patient, as well as the time interval between the injury and the development of the pneumonia.

Extrathoracic trauma may and often produces, pneumonia by a chain of factors which destroy the defensive mechanism of the lungs. Causation is not necessarily related to side of injury or time elaspsing between the occurrence of the accident and the development of pneumonia, be it hypostatic, lobar or embolic. The age of the patient and this resistance play an important role together with the severity of the injury, the postural nature of the treatment and other factors such as unusual exposures to inclement weather.

In the particular case that I wish to present, the trauma consisted of a fracture of the neck of the right femur occurring on 12-4-36, followed by a catastrophe on 3-7-37, 70 days after the accident.

The Referee who heard the claim decided to disallow it. An appeal was taken before the Pennsylvania Workmen's Compensation Board and I was appointed as an impartial expert. The case was remanded to the original Referee and I submitted a report to him after studying all the available records. This report was followed by testimony and cross examination at a subsequent hearing.

In this second hearing the Referee reversed himself and made an award to the claimant which was reaffirmed by the Board.

Case

HISTORY OF INJURY: The deceased, apparently a laborer, 53 years old, according to the Compensation Agreement was "barring down rock, and a piece slid off the pile and struck his leg, fracturing right hip." This injury was determined on 12-11-35 and later by the Roentgenologist of the . . . . Hospital, Dr. . . . ., to consist of "fracture of the neck of the right femur. The shaft is displaced proximomedial and fracture appears to be impacted. There is one inch shortening. 1-27-37. There is slight upward and lateral displacement of the shaft. Beginning union. Notice callus just above the lesser trochanter. Some rotation."

The deceased was admitted to the . . . . Hospital following the injury on 12-11-36 and discharged on 2-28-37. Upon discharge he was carried home in a Plymouth sedan, covering a distance of about two and a half to three miles. During this transit he complained of feeling chilly. He remained home until March 3, 1937, and was again re-admitted to the hospital with a provisional diagnosis of lobar pneumonia, bronchial. He died on March 7, 1937, with the final diagnosis of lobar pneumonia, pleurisy with effusion. The death certificate was signed by Dr. . . . . .

SIGNIFICANT MEDICAL FACTS FOUNDED IN HOSPITAL RECORDS: On admission he complained of pain in right leg, inability to walk, or put weight on extremities. His general history was good.

There was no history of familial or hereditary disease. A system review or general examination was essentially negative. His blood pressure was 120/80. Head, neck, thorax, abdomen and extremities were negative with exception of the fracture. In other words, he was a healthy specimen when he entered the hospital.

He was strapped on the bed and Buck's exten-

sion was placed on him in order to hold the injured leg in proper alignment for bony union.

On 12-22, or 11 days after admission, his temperature was elevated and he complained of pain in the chest. The pharynx was inflamed. On 12-24 he again complained of pain in the right side of the chest with occasional productive expectoration. On 1-5-37 the temperature was fluctuating and he had hoarseness of voice with laryngitis. This again subsided. On 1-13-36 he again complained of sore throat. The temperature was irregular until 2-23-37 when the attending physician made a note of grippe. The temperature on 2-23 reached as high as 104° which fluctuated until the day he was discharged, 2-28-36, when it was 98-1/5°, but the previous day it had reached 99° which is above normal, and judging from the behaviour of the temperature chart, this irregular temperature probably continued up to the last day he was at home on March 3, 1937.

The second hospital records, beginning March 3, 1937, show that the deceased was admitted with a pain in the chest, cough and fever. His pharynx was hyperemic or inflamed. He had dullness on the left base. On 3-3-37 his temperature was elevated, his pulse rapid, and he was coughing and expectorating a yellow mucoid sputum. The following day he was administered digitalis for his heart. On 3-4-37 his pulse was very irregular. On the following day he was markedly cyanotic and dyspnic, in other words, he had labored respiration. His temperature had reached 105° pulse was 140 and respiration 56. On 3-6-37 his heart sounds were poor and the chest was full of "sticky rales". He expired on 3-7-37 at 12:10 P.M.

Opinion

BASED on the medical information at my disposal, I arrive at the following conclusions:

When this man was admitted to the hospital, he was in a good physical condition. He was strapped on the bed in order to correct the deformity caused by the fracture. At various times he developed a temperature which was the direct result of his postural condition. In the hospital he had pharyngitis, laryngitis, grippe, etc. Due to his posture he had hypostatic congestion of the lungs which is an inevitable occurrence in a patient forced by the Buck's extension and other strapping to remain in a certain posture for about 70 days. He had hypoventilation or decreased ventilation of his lungs also due to his posture. His heart was in a state of least activity. It is a known physiological fact that in a recumbent position the cardio-respiratory system is at the lowest ebb. As the patient sits up his heart becomes more active, as he stands up, both his heart and lungs are more active, as he is sent home there is always the danger of a great strain being thrown on the cardio-respiratory system which may develop into dilatation of the heart. The deceased left the hospital with his system loaded with infected germs. His cardio-respiratory system was undoubtedly damaged. All of this directly contributed to the development of his lung condition which might have been lobar pneumonia, embolic pneumonia, or terminal pneumonia, all of which give the same physical signs. It cannot be definitely said that this man suffered from lobar pneumonia. The hospital records do not show that an x-ray was taken. There was no typing for pneumonia to determine the particular type of disease. There was no sputum examination revealing the pneumococcus specific for pneumonia. There was no autopsy made. All of these means were, of course, available to the hospital. The diagnosis was solely based on physical signs as shown by the death certificate.

It is, therefore, my professional opinion that the fracture of the right femur, which is a serious injury, was directly responsible for the death. Had he not sustained a fractured hip, he would not have been strapped on the bed, damaged his lungs by hypostatic congestion, suffered frequent attacks of upper respiratory infections, damaged his heart, his blood by a concomitant secondary anemia, or reduced the defensive powers of the blood against invading organisms, by destruction of phagocytes.

His original injury, therefore, by a chain of successive phenomena establishing a causal relationship, was responsible for his death. As a matter of fact, there was no intervening period of recovery or return to work. Terminal pneumonia, whether of a hypostatic nature, which I believe this was, or a lobar, bronchopneumonic or embolic, commonly exterminates the lives of unfortunates afflicted with hip fractures.

Pneumonias in similar cases are not necessarily germ diseases. The claimant's husband, had he lived, would have been a permanent total disability case but he died during a period of convalescence, since fractured hips do not recover in less than six months at least.

Not only was his resistance to respiratory infections reduced, his susceptibility increased and his vitality lowered, but also by reason of his hip fracture he actually and mechanically damaged his lungs which resulted in his death from what I believe hypostatic pneumonia, which is a terminal pneumonia occurring in about 10% of hip fractures during the period of convalescence which usually extends as already stated to about six months. If the man died of embolic pneumonia, which is a possibility similar to the one assumed by Dr. . . . as lobar pneumonia based on physical signs, we still have a more direct causal connection, such as the dislodging of the thrombus or fat embolus which by blocking a major pulmonary vein gave rise to the physical signs found by the attending physician.

However, it is my firm conviction that his man had hypostatic pneumonia caused by his forced corrective posture. This disease need not be due to germs but germs may secondly invade the already damaged lung tissues.

Summary

THE status of traumatic pneumonia is still in the controversial stage, especially because of its compensatory nature. Direct trauma to the chest wall and a succession of pathological pul-

monary phenomena, within reasonable time, militates in favor of the injured. Pneumonia, however, can arise from extrathoracic trauma, either through bulbar inhibition or through a chain of clinical phenomena reducing the defensive mechanism of the lung. The case cited presented a series of events which definitely established a direct connection between trauma and pulmonary pathology.

The Plastic Repair of Cutaneous Injuries of the Hand

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THE cutaneous wounds of the hand which are of significance in plastic surgery may be classified under the following headings:

1. Lacerations, puncture wounds, and abrasions.
2. Avulsions.
3. Skin loss from burns and sloughs following severe contusions.

Lacerations, Puncture Wounds, and Abrasions

THE repair of lacerated wounds of the hand should be undertaken as early as possible. Although no maximum lapse of time can be arbitrarily made when one should hesitate to close the wound, I feel that a six to eight hour period following hand injuries should not be exceeded. More contamination than the tissues can tolerate is likely to be present after a longer period.

As with many other "so-called" minor procedures, one should not attempt to undertake extensive repair unless he is equipped to properly finish the task. In other words, if complete facilities are not available when the patient is first seen, only first-aid therapy should be given, following which the patient should be transferred to a well equipped operating room for the main part of his treatment.

Once ready to begin repair, the wound is first prepared under anesthesia. In choosing the type of antiseptic to use one must consider the power of healthy living tissues to combat infection as against the effect produced by strong chemicals. It is generally accepted that thorough cleansing with mild soap and sterile water is preferred. Soap should be applied with the least possible trauma, using soft sterile gauze and not stiff brushes. If paint or grease has soiled the wound, it may be dissolved with benzine or ether. The cleansing process should be done with the surgeon wearing a sterile gown and gloves and with adequate assistants so that it will be unnecessary for him to become contaminated during the process.

Many wounds of the hand will contain inground foreign bodies. These should be removed immediately by scrubbing as gently as possible with gauze or sterile brush as indicated. If these inground abrasions occur simultaneously with lacerations, one should be careful to avoid using the brush in a way that will produce trauma to any of the exposed subcutaneous tissues.

As soon as the wound has been thoroughly cleansed the hair should then be shaved from the dorsum of the hand and fingers if the injury has been carried into this area. Following shaving, the wound is again cleansed with mild soap, after which all soapy solution is removed by irrigation with sterile water. The wound is temporarily covered with sterile dry gauze and the field draped for operation. The surgeon and his assistant should now change to clean gowns and gloves before proceeding with the wound closure.

All bleeding points should be carefully isolated and ligated with fine plain cat-gut or silk, according to the individual surgeon's choice. One must remember the importance of blood supply in wound healing. Too large bites of tissue in the hemostats must be avoided or subsequent areas of necrosis may ensue. This, along with the development of hematomata, predisposes to infection in the wound.

Contused areas should be carefully but conservatively debrided. Small jagged bits of skin are apt to have their blood supply so diminished that necrosis will follow. It may therefore be wise to excise them so as to avoid this potential danger.

The wound is now ready to be closed with interrupted sutures of some type of fine non-absorbable material. Sufficient sutures should be inserted so as to accurately approximate all skin edges. It is unwise to insert an excessive number for fear of interfering with the local blood supply of the skin edge, which will result in unnecessary necrosis. The sutures should be loosely applied, i.e., with just sufficient tension to secure accurate approximation. Constriction, too, will produce unnecessary sloughing. It must be remembered that there is very little redundant skin to be sacrificed in either the hand or fingers. Consequently, if it is noted that the sutures have to be placed under any undue tension in an effort to produce approximation, they should not be inserted, but the wound closed by covering any such defects with a properly selected skin graft.

After closure, the wound is covered with sterile dry dressings. If the injury is at all extensive, or if the lacerations have occurred through areas of tension, the hand should be immobilized by an appropriate type of splint.

Puncture wounds are prepared similar to lacerations. Undue probing of the wound should be avoided except for the removal of foreign bodies. Closure by suture is rarely indicated. The prophylactic use of tetanus or tetanus-perfringens antitoxin must not be overlooked in the general management of all cutaneous wounds whenever the indications for its use arise.

Avulsions

LARGE and small portions of skin may be partially or completely avulsed. If these avulsed portions of skin are connected with a pedicle in-

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suring adequate blood supply to nourish the flap, simple suture as one would do in a laceration is all that is indicated. Mild pressure dressings applied postoperatively will minimize the hazard of passive congestion developing in the flap, which, if severe enough, might predispose to moist gangrene.

On the other hand, if this flap is attached by only a small pedicle or is completely detached, then it is better to treat this portion of skin as a free full-thickness graft. Since free full-thickness grafts with attached fat will not grow, it is necessary to excise any attached subcutaneous fat and then suture the skin into its bed with fine interrupted non-absorbable sutures. Pressure dressings are applied for 10 to 14 days.

If one is dealing with an avulsion of skin in which the avulsed portion cannot be found, or is too badly damaged to use, an immediate graft should be applied to cover this area.

In dealing with either simple lacerations or avulsions I personally do not like to use drains. I feel that they predispose to infection rather than help to avoid it. If the wound is seen within a reasonable length of time following injury it should invariably be closed tightly and drains inserted only if conditions warrant exceptions to this rule. Dry dressings are applied and the wound inspected in 24 hours. If at that time there is evidence of any impending infection, sufficient sutures may be removed to allow for adequate drainage. If the wound appears clean, it is redressed with dry dressings, only to be changed as often as the individual condition seems to warrant.

Burns and Sloughs Following Severe Contusions

THE immediate treatment of burns has been well standardized so that the choice of method is more or less open to the individual surgeon. If the burn has become infected beneath the overlying crust, or if one sees an infection following a neglected avulsion, surgical drainage, followed by the application of continuous warm, moist saline packs will soon produce a bed capable of taking a graft.

In third degree burns where there results an open granulating area, the treatment unfortunately is often neglected. These areas should be grafted as early as possible. By so doing unlimited discomfort may be spared in addition to the financial economy gained by the patient to have his wounds closed in a short period of time by a permanent covering. This surgery may be done just as soon as the granulating bed is clean. In other words, as soon as the crusts have been removed the wound should be carefully debrided and the underlying defect prepared for grafting. This usually occurs within three weeks following the original trauma, unless tendons or deeper structures have been exposed. If for any reason it may be necessary to delay grafting, the hand and fingers should be maintained in the position of function for this period.

In considering the late treatment of burns, I like to imagine the condition as one producing a loss of skin that might have just as well resulted from an excision. After the damage has been done, one is confronted with an open cutaneous defect that might have arisen from either cause. Severe contusions of the hand often predispose to subsequent sloughing of skin, which, in the late stage, produces a skin defect comparable to that of a third degree burn.

If dealing with an early but infected granulating area preparation may be hastened by applying moist dressings of physiological saline or Dakin solution under moderate pressure, such dressings being kept warm and moist and changed every few hours. More recently we have been using azochloramid solution in triacetin. We have found it to be much more efficient and more simple to use, and furthermore dressings have to be changed but once every 24 hours.

If the burn has been neglected, old ulcerations or other areas that have long-standing granulations present should be excised. If the resulting area is relatively clean skin grafting may be done at once. Otherwise the base is permitted to regranulate for a few days until firm pink healthy granulations are present in all areas. We do not ordinarily make bacterial counts, relying instead upon our experience and judgment to tell when the bed does or does not present an adequate healthy appearance.

If the burned area has been further neglected and resulting contracting scars have been permitted to occur it is then necessary to completely excise the cicatrix, following which a permanent type of graft is immediately applied. It is to be remembered that in the preparation of healed defects, one should avoid exposure of any underlyign tendons if a free graft is to be used. It is better to leave a thin film of scar on the tendon. Likewise, damage to nerves and blood vessels is to be avoided.

This brings up the selection and discussion of the types of grafts.

Types of Grafts

IN DECIDING upon the type of graft to use one must consider the simplicity, the comfort and safety of the patient, and the final cosmetic and functional result. Whenever possible a free graft is to be preferred to a pedicle graft because of its comparative simplicity. Furthermore, free grafts fit the hand and fingers more closely than flaps. When one has an adequate subcutaneous fat pad, some type of split graft may be used. This is to be preferred because of its greater certainty of take. These grafts are ordinarily cut to contain 50 to 80% of the thickness of the skin and should be designed to cover the defect in one piece. They behave very well on extensor surfaces and the thicker variety quite satisfactorily on flexor surfaces, unless the patient's hand will be subjected to considerable trauma. They do not, however, control subsequent underlying scar contraction as well as full thickness grafts.

It should be mentioned here that except for a temporary covering, pinch grafts have little prac-

tical use in the practice of those doing any amount of reconstructive surgery. It has been our experience that larger grafts grow better and give a much better final result. Pinch grafts give rise to considerable contraction due to scarring between the transplanted islands of skin. The healed covering does not stand trauma well. Carcinoma occasionally develops in pinch grafted areas since these poorly vascularized surfaces easily break down. Any of these conditions frequently gives rise to the necessity of excision and re-grafting with another type. However, in the hands of the occasional operator who is not accustomed to utilizing all types of grafts, an indication for their use by him must be considered. It should be remembered that if this covering is not satisfactory, it may be replaced at a future date by someone who is familiar with some of the more complicated procedures.

I feel that if one wishes to obtain the best functional result so that the patient will get the maximum amount of flexion and extension, a free full-thickness graft is to be preferred. In men doing heavy manual labor this type of graft will stand up better than the thinner variety. It must be realized, however, that the certainty of take of a Wolfe graft is less than that of a split graft. Nevertheless, in spite of this fact, I still feel that even if the graft does not take it is better to have used it on most flexor and palmar surfaces, and repair any losses at a subsequent stage.

The Z-plastic procedure which is so useful for the functional correction of certain linear scar contractures, unfortunately has little practical application in hand plastics. This is because there is not enough lax skin available with which to design the necessary flaps as one finds for example, in certain axillary and neck contractures.

When there has been a loss of skin and its subcutaneous fat pad, it is frequently necessary to replace the layer of fat along with the skin before adequate functional results can be expected. Since fat cannot be transplanted with a free full-thickness graft it becomes necessary to utilize some type of pedicle flap. However, one may apply a temporary thin split graft directly over muscle, bone or tendon if a situation occurs wherein a pedicle flap cannot be applied at once. By so doing, the compound wound is immediately closed and the underlying structures thereby protected and preserved. When the time arrives to apply the permanent covering, the thin graft and adjacent scar are excised and a flap secured in place. If tendons have been exposed, skin containing a subcutaneous fat pad is necessary to produce good functional results. Moreover, if tendons have been lost and are to be repaired at a later date, the defect first should be covered with a pedicle containing a good layer of fat. This may be reopened with safety when the tendon transplant is done.

Flaps for this type of surgery are ordinarily raised from the abdomen where there is an adequate layer of subcutaneous fat, where a generous donor site is available, and where the skin is of similar thickness to that of the hand. Losses involving the terminal half of the finger can usually be repaired by a simple flat pedicle. On the other hand, if the entire flexor half of the finger is to be covered, it is usually wiser to first tube such a flap and later transfer it to the finger, since the process of tubing helps to increase the viability of such a long slender flap.

Large deep losses of the dorsal aspect of the hand and fingers are best repaired by utilizing a bi-pedical, sometimes called a gauntlet or glove flap, wherein the hand is inserted into a previously designed pocket in the anterior abdominal wall. I do not care for the utilization of gauntlet flaps from the lumbar region to repair large flexor defects of the hand because the blood supply to the skin of the back is comparatively poor and the skin too thick for practical uses. I prefer instead to use a simple pedunculated flap taken from the abdomen or the inner aspect of the thigh.

Wounds following accidental amputation of fingers or finger tips should be covered at once, using either a free full thickness skin graft or a pedicle flap, depending whether or not a fat pad is needed.

Conclusions

ALL lacerations should be carefully prepared and accurately sutured.

2. Avulsed flaps should be sutured in place and a pressure dressing applied. If these flaps are lost or badly damaged, the wound should be covered with a primary skin graft.

3. Defects following burns should be skin grafted as early as possible.

4. Scar contractures should be excised and the defect skin grafted.

5. Defects involving kinetic areas should not be permitted to cover over with scar tissue. Contractures will result and this in turn interferes with function.

6. Careful thought must be given in selecting the most desirable graft to be used for each individual problem.

7. Postoperative physio- and occupational-therapy should be instituted as early as possible to produce the most desirable functional results.

Discussion:

DR. MICHAEL L. MASON, Chicago: I do not think that I can add anything much to what Dr. Greeley has had to say. Keeping in mind that we like to obtain primary closure of every wound within a six to eight hour limit, the question of applying skin to a wound comes up very often. The saving in time and the saving of patients from infection and contractions which we can accomplish by the immediate application of skin grafts I think is certainly well worth the time and effort. I think, as Dr. Greeley does, that most of the immediate grafting we have to do on hand can be accomplished with the thick skin graft which Blair described. Usually if we put them on little tiny areas where there is simple and small loss of skin we can save the patient a great deal of time.

Once in awhile the back flap will come into consideration where we have to apply a pedunculated flap immediately. Usually if a hand needs to be repaired with a layer of skin, I would raise a small flap on the thigh and then put that hand into the flap on the thigh.

DR. PAUL. W. GREELEY, (closing): There is only one thing I would like to add, and that is if one is raising a flap in which to cover the flexor surface of the

hand or fingers, he is always wise to select an area of skin which is free from hair, because it is always rather embarrassing to the patient if you have put a flap of skin on his hand that bears hair, and he never thanks you for that. That is one thing that is very often forgotten.

As for the question of what we can do about the hair if we do get it, there are various ways of getting around that. One method is the laborious process of electrolysis and removing the hairs one at a time. Another good method is to raise up the flap of skin after it is well adjusted, or if you have to use a flap of skin which you know is going to have hair, raise it up and shave off the hair follices from the interior surface and then put the flap back down. In that way you would destroy the hairy surface, but you have to be careful not to shave too closely.

Toilet-Seat Dermatitis

—In a Butcher—

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WITH the understanding that an "occupational disease" is one which results from the nature of employment, I thought it would be interesting to report this case, not so much from the standpoint of causal relationship as from its definite relation to the recurrence of the eruption each time the patient returned to his place of business. If we follow the rule in industrial skin affections that the dermatitis usually appears while the patient is at work or shortly thereafter, disappears or improves when he is away from work and reappears soon after his return, when such a dermatitis appears each time upon the buttocks of a butcher, one can readily understand the unusual problem of causal relationship that arises.

Toilet-seat dermatitis, produced by substances such as paint, varnish, lacquer, cleansing powders, volatile oils, woods, etc., is known to occur and has been described by Cummer.[1] I have seen several cases due to newly painted toilet seats.

It appears that the clinical and diagnostic interest involved here is of interest to us as physicians, and I will therefore leave the medicolegal aspect to those who are more qualified to pass upon that phase.

Case Report

MR. J. K., white male, 48 years old, was seen by me on April 8, 1940. His story was that a severe rash broke out on or about May 15, 1939, over the buttocks and posterior aspects of the thighs, with marked swelling of the skin on the affected areas, and many water blisters. This was followed within 24 hours by an outbreak on the face, neck, and hands. He had to stop working, and within two weeks the rash cleared entirely. Upon his return to work, there was an immediate recurrence of the same eruption on the same locations. He again stopped working and the rash cleared completely. Instead of returning to work, he entered a hospital for a herniotomy in July, and did not return to work until late in September. In the interim, his skin remained completely clear. The day he returned to work in September, the eruption reappeared, and again, with postassium permanganate baths, it cleared. The same story repeated itself several times up to April 1, 1940, when the rash became very severe, involving the buttocks, genitals, face, neck, and hands.

When I examined him on April 8, 1940, I found a vesicular and bullous eruption on an erythematous and markedly edematous base; some areas were covered by crusts, erosions, and fissures. The entire surface of the buttocks was involved with distinct, well-definied, curved borders, assuming the outline of a toilet seat. Some of this inflammatory process extended down on the posterior surfaces of the thighs. He also had a pinpoint, vesicular eruption on the cheeks, neck, and hands. The penis and scrotum were markedly edematous and affected by a similar dermatitis as on the buttocks. I immediately suspected the toilet seat as the cause, and upon questioning the patient, he recalled that soon after this toilet had been installed in May, 1939, he started to develop the eruption. He also told me that in conjunction with his butchering, one of his duties was to wash the toilet with a solution, known by the trade name of C. N. A patch test with a 1% solution was negative, and with a 10% solution faintly positive. I felt that the severity of the eruption called for a more severe reaction to a patch test, if C. N. were the cause. I then had him bring me some scrapings of a brownish paint from this toilet seat. Within about six to eight hours, the arm where the patch test had been applied, felt itchy and burning. During the night, he claimed that he felt sick, lost his appetite, feverish and nauseous, and had a headache. A flare-up occurred in the eruption on all the locations affected.

My reading of the patch test within 24 hours presented the following picture: a vesicular and bullous eruption taking the outline of the square piece of gauze containing the scrapings. On the surrounding skin, for a distance of about three inches, there were pale pinkish macules, some urticarial papules, and slight edema of the skin nearest to the patch test. There was a flare-up of the eruption on all the affected parts.

Summary

A DERMATITIS venenata, with recurrent outbreaks on the buttocks, assuming the outline of a toilet seat, recurred upon return to work.

2. A four plus flare-up and reaction was obtained on patch test with scrapings containing a brownish paint; a one plus reaction to a cleansing solution with the trade name of C. N.

A SLIGHT rise in the United States death rate last year, as compared with 1938, is reported by the U. S. Bureau of the Census in a preliminary tabulation for 1939 just made public. A total of 1,387,797 deaths last year resulted in a preliminary mortality rate of 10.7 deaths per 1000 estimated population.

1. CUMMER, CLYDE L.: "Toilet-seat dermatitis produced by red stain," *Arch. Dermat. & Syph.*, 27:976-979, June, 1933.

Central States Society

—Twenty-First Annual Meeting, May 21, 1940, Peoria, Illinois—

THE Twenty-First Annual Meeting of the CENTRAL STATES SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY, a component society of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, was held in conjunction with the Centennial Anniversary of the Illinois State Medical Society on May 21, 1940, at Peoria, Illinois. DR. HAROLD A. VONACHEN, of Peoria, the President of the Society, presided and DR. EDWARD C. HOLMBLAD, of Chicago, was Program Chairman.

The afternoon session was a joint meeting with the Surgical Section of the Illinois State Medical Society, at which session DR. FREDERICK H. CHRISTOPHER, Chairman of the Surgical Section, presided. The program follows:

Morning Session

"MEDICOLEGAL Typing of Occupational Disease Cases" (with four illustrative case histories), C. O. SAPPINGTON, M.D., DR.P.H., Chicago.

Ten-Minute Reports followed by Round Table Discussions as to the "Newer Developments and Present Status of the following Industrial Problems:

"Absenteeism" — GEORGE W. STABEN, M.D., Springfield.

"Physical Examinations" — URBAN R. GEBHARD, M.D., Milwaukee.

"Specific Loss Appraisals" — VOLNEY S. CHENEY, M.D., Chicago.

"Hernia"—WILL LYON, M.D., Chicago.

"Back Injuries" — FREDERICK W. SLOBE, M.D., Chicago.

"Syphilis in Industry" — PAUL PALMER, M.D., Peoria.

"Economics of Industrial Medicine and Surgery" —JAMES A. VALENTINE, M.D., and FRED M. MILLER M.D., of Chicago.

General Open Forum Discussion.

Afternoon Session

"WOUND Healing" — MICHAEL MASON, M.D., Chicago.

"Care of Infected Wounds" — DAVID J. LEWIS, M.D., Springfield.

"Postoperative Embolism and Thrombosis" — GEZA DE TAKATS, M.D., Chicago.

"Treatment of Compound Fractures"—WILLIAM R. CUBBINS, M.D., JAMES J. CALLAHAN, M.D., and CARLO S. SCUDERI, M.D., of Chicago.

"Treatment of Burns"—CHESTER R. ZEISS, M.D., Chicago.

Tuesday Morning

DR. C. O. SAPPINGTON, in discussing "Medicolegal Typing of Occupational Disease Cases," stressed especially the necessity for an appreciation of industrial etiology by the examining physicians in the preparation of medicolegal cases. Etiology specifically involves the use of industrial hygiene procedures in the appraisal of employment exposures; differential diagnosis embraces the establishment of cause-and-effect relationships between the industrial environment and the physical and clinical laboratory findings; disability evaluation includes proving that disability is directly caused by an occupational disease.

These three variables, etiology (employment), the differential diagnosis of an occupational disease, and the estimation of disability from a true occupational disease, form the basis for the arrangement of case types in four different categories.

Case histories, selected from actual practice, served to illustrate the four different case types which were described as follows:

In Case Type I, the employment exposure was positive and there was occupational disease with resulting disability.

In Case Type II, the employment exposure was negative, but there was previously existing occupational disease with resulting disability.

In Case Type III, the employment exposure was negative, and there was no occupational disease, but disability was caused by a non-occupational disease.

In Case Type IV, there was negative employment exposure, no occupational disease, and no disability.

In summary, it was stated that the experience with these cases demonstrated the difficulty of securing adequate diagnosis of occupational disease even in an apparently well regulated university clinic, and also from well informed general practitioners of medicine. Likewise, it was shown that difficulty arises in getting adequate laboratory examinations.

The relationship of specific etiology in the industrial environment through careful industrial hygiene studies is the foundation for the principle of establishing definite cause-and-effect relationships between employment and disease; these two factors also must be directly related to proved disability.

Finally, by the use of case histories, it was pointed out that critical medicolegal procedures properly adapted to occupational disease problems shorten disability periods and save time, money and men to the employer.

DR. M. H. KRONENBERG and DR. A. S. LEVEN discussed DR. SAPPINGTON'S presentation. DR. KRONENBERG believed that there was not sufficient acquaintship on the part of physicians with the industrial factors which cause occupational disease. The history of the cases will help especially where an employee is disabled from an occupational disease without having sufficient etiology in the working environment to produce the disease. He has been surprised at professional testimony on both sides of these cases in reviewing evidence of a number of cases coming before the industrial commission—there have been gross mistakes made in such testimony—and this situation needed very definite clarification. DR. LEVEN cited his recent visit to the U.S.S.R. where there is an occupational institute which investigates very thoroughly the complaints which are made by employees relative

to working conditions—where a diseased employee is not allowed to return to work in the same environment until the hazard can be controlled; furthermore, other exposed employees are also removed from such exposure, when proved hazardous, until a remedy can be applied.

DR. URBAN E. GEBHARD spoke on "Physical Examinations." The Wisconsin Plan of Physical Examinations was cited as a recent example of activity on this subject.

It is believed that physical examinations in industry are well justified and, further, that the promotion of industrial health is justified. Pre-employment examinations are certainly imperative for some types of industrial groups, but should be limited to the aspect of employability and not extended to a general health plan. The latter type of procedures would be considered an encroachment on the work of private practitioners. The speaker also believed that both the employer and the employee should have a copy of the findings of the physical examinations.

In summary, it was stated that periodic examinations should certainly be done in hazardous occupation, but it is questionable as to whether periodic examinations should be applied to the industrial group as a whole; it certainly is not industry's obligation to establish a complete health program.

DRS. KRONENBERG, LEVEN, SAPPINGTON and ZEISS discussed DR. GEBHARD'S paper. There was fairly general agreement among the discussants that there was no need to encroach upon the rights of the family practitioner. However, it was definitely emphasized that the great losses from non-industrial injury and illness constituted an economic problem for industrial organizations and that much could be done without duplicating the work of the general practitioner, such procedures being ordinarily classed as health promotion. It was pointed out also that the large industries are promoting such programs of health among workers today and that the trend is in the direction of greater extension of such services.

DR. PAUL PALMER discussed the subject of "Syphilis in Industry." The great increase in interest in the syphilis program in industry during the past five years has brought an increasing number of papers on this subject. The United States Public Health Service has stated that of the 15 million employed persons in the various industries, the loss of time because of luetic infection in this group amounts in the aggregate to a million years. The answer is obviously a syphilis control program in industry, referring cases for treatment to family physicians, checking up on treatments, in which program the plant physician acts as an adviser.

In the Caterpillar plan, a Kahn test is taken during the physical examination procedure and if positive, an interview is obtained with the employee; advice is given to recheck the Kahn reaction by the family physician and if found positive, there is a confidential relationship set up, and a periodic checking service with reference to treatment, the employee being allowed to continue work if physical status and the treatment schedule are satisfactory. In this experience, it was found that there was an average of 1.6% positives in the employed group.

There have been very salutary results in this program, expressed in cutting down of lost time, the establishment of better reaction time in employees, and better working capability.

MR. BEN KUECHLE, of Employers Mutuals of Wisconsin, discussed experience with the occupational disease law and the physical examination program in the State of Wisconsin.

The first occupational disease law was effective in Wisconsin in 1919, but the expression "occupational disease" is not to be found in the law—instead every injury of any type is made compensable. For a period of approximately 14 years, from 1919 to 1933, there was a deluge of occupational disease claims. It was thus apparent that it was necessary for industry to clean house and that also employees should be examined before and during employment. It was pointed out that the original law vested the industrial commission with the power to do anything within reason to protect the health and safety of industrial employees.

In setting up a physical examination program in the State of Wisconsin, it was necessary to secure the agreement of both labor and industry, which was subsequently accomplished. This was done through committees and through various types of groups both by labor and industry and differences were "ironed out" from time to time with the result that there has now been established a system of physical examinations for industrial employees which actually works and is beneficial in its results to all parties concerned.

DR. GEORGE W. STABEN presented a paper on "Absenteeism." Relatively greater amount of absenteeism from illness as compared with injury has been appreciated for a long time. In a plant experience recently it was found that respiratory affections accounted for 36% of the absenteeism; that there was a total annual loss of 29,000 days, which figured at the rate of $4.00 wage scale per day, as a loss of $116,604 annually.

Studies of this kind indicate that more complete records are necessary for good results.

There has been a considerable amount of work done at the University of Minnesota with respect to the control of colds through vaccines, but according to the study which was made, there was no appreciable difference between groups on which vaccine had been used as compared with control groups.

Recommendations as made by the Congress on Industrial Health of the American Medical Association with reference to the control of absenteeism were cited and briefly commented upon.

It was concluded that the part-time physician in industry should carry on a real constructive program with reference to the control of absenteeism among industrial employees.

DR. J. H. FINCH presented a different aspect of the subject "Absenteeism," particularly with reference to the cutting down of lost time through properly adapted procedures in the prompt treatment of minor injuries.

The discussion included the type of dressing to use (to seal in sterility and to seal out infection), the avoidance of pressure on wound, special coverings for fingers and toes, splints, adapting the dressing to the comfort of the wearer, the use of ambulatory devices, all of which when properly adapted to each specific case can result in a definite saving of time.

IN THE absence of DR. WILL LYON, his paper was presented on the subject of "Hernia," by DR. EDWARD C. HOLMBLAD. DR. LYON stressed three points with regard to the subject, etiology, treatment, and type of risk.

There is overwhelming evidence that nearly all hernias are congenital in origin.

DR. LYON cited an improvement in Wagensteen's method of herniotomy as modified by Burton. A preference was expressed for the use of silk sutures as giving the best results.

A unique principle in the experience of the essayist is the acceptance of applicants with hernia, without the demand that a truss be worn. In a large series of cases over a long period of time there has never been a claim of aggravation and there has only been one case of strangulation.

In the discussion of the hernia paper by DR. HOLMBLAD, he pointed out the possibility of missing a hernia in an examination, because of a collapse of the sac; hence it is always well to examine the applicant in a standing position at the end of the day after having been on the feet. The trend to silk sutures is very definite. There is also a definite trend in the direction of reduction of amount of time consumed in hospitalization in operative cases of hernia, as there is the same trend after other major operations.

DR. JAMES A. VALENTINE discussed the hernia presentation. He believes that the patient should be encouraged and made to think that it was nothing disgraceful and nothing to be alarmed about if he had a hernia. Why make the patient worry about a condition which, in DR. LYON'S experience and in the experience of others, can be so easily adjusted. The high incidence of hernia in certain types of groups which apparently get along very well (such as policemen) is very good evidence that we have been led to believe and led others to believe that such conditions are more serious than they really are.

DR. FREDERICK W. SLOBE spoke on "Back Injuries." Three groups were outlined in this discussion, the protrusion of intervertebral discs, arthritis of the spine, and a mixed group, occurring because of strain or infection, or a combination of both.

In a series of 10,000 orthopedic examinations, an incidence of 2% of cases of protruded intervertebral disc was found. It was believed that this is fairly consistent with the actual occurrence of this type of injury. Spinograms have been used more recently and have an advantage over lipiodol injections; however, x-ray films of such spinograms are more difficult to interpret and also the technique must be especially developed. Ordinarily results are not as good in industrial practice as in private work, because of the difference of the attitude of the patient and the medicolegal implications. Furthermore, a patient may have a considerable interval of time between episodes and thus not be available for check-up.

In the arthritis group, usually many x-ray films from different positions are necessary for adequate diagnosis. Furthermore, the treatment ranges over a wide variety of types and detailed consideration must be given both to the diagnosis and treatment.

In the mixed group, injection therapy can usually be used to good effect. The adequacy of mobilization is important and in some instances a fasciotomy will need to be done.

A series of lantern slides was shown depicting the sensory distribution of the 12th dorsal and first lumbar nerves, the tenderness zones according to Steindler, and a chart showing sites for paravertebral injections.

AS THE last number on the program, DR. JAMES A. VALENTINE spoke on the subject of "Economics in Industrial Medicine and Surgery." This discussion was grouped around three headings, the workmen's compensation acts, the occupational disease acts, and pre-employment and periodic examinations.

Experiences were cited relative to hysteria of manufacturers at the time when occupational disease legislation was being formulated or about to be passed and the apparent inability of industrial medical men to advise the manufacturers intelligently.

Particular stress was laid on the necessity of the standardization of acceptance factors with reference to the pre-employment examinations. Such a standardization and agreement are greatly to be desired and must necessarily be developed, if there is to be a fairly consistent basis for the interpretation and application of physical examination findings at time of employment.

Tuesday Afternoon—Joint Meeting

DR. MASON opened the afternoon session with a paper on "Wound Healing."

There is a great temptation not to let Nature alone when wounds occur. The healing of a wound may be divided into three parts: (1) the exudative phase (four to five days); (2) fibroplasia, during which the strength of the tissues increases; and (3) organization, when true union of tissues occurs.

There must be a good blood supply and freedom from untoward influences. Normal tissue is necessary to healing and anything that interferes with the blood supply is therefore disturbing. Venous return is also very important. Edema and hemorrhage interfere. There may be chemical irritants of various types, and mechanical irritants (foreign bodies) or foreign body material introduced by the surgeon.

The one element common to all wounds is the necessity for closure.

Infection is a complication of healing. Sterilization of the wound occurs really by the growth of healthy tissue. Infection is due usually to secondary invaders. Experience has shown that infection occurs 30% in excess in persons over 50. The metabolism of the individual is important. Dehydration and overhydration are also very definite factors. Electrolytes also have to be considered. Fluid loss into tissue is a vital factor. Vitamins play a very definite part in healing. Finally, the general condition of the patient should also receive definite attention and should be, if necessary, improved.

DR. DAVID J. LEWIS discussed the subject of "Care of Infected Wounds." This discussion was limited to traumatic wounds.

One must always keep in mind that there are bacteria on the surface of the skin and that infection may develop in a few hours.

The wound should be cleansed under aseptic conditions, the skin should be scrubbed about the wound and instruments used should be properly sterilized. One of the first considerations is to promote accurate apposition of the wound edges.

In the recent Spanish war, experiences showed the efficacy of vaseline packs used in wounds involving fractures.

An infected wound should not be closed; vaseline pack has been found efficient in stimulating the growth of graulation tissue.

Drainage should alwayy be facilitated and isotonic salt solution has been found valuable.

More recently the sulphur compounds have been found to be of considerable help in their bacteriostatic action.

There is considerable doubt about the justification of the use of antiseptics on dressings—so many of these are toxic to tissue cells. There are some which are less toxic than others, but zinc peroxide seems to be the most valuable in this connection, although it necessitates daily changes of dressings.

Maggotts, allantoin, and urea have been used in various ways — these materials are fairly low in cost and are free from irritating properties. A 2% solution of ammonium bicarbonate has been found to be effective in the digestion of proteins and also does not possess irritative properties.

Sterilization of the wound area must eventually take place and simple cleansing has proved to be a vital factor. Tissue metabolism should also be improved. Drains of fine mesh gauze impregnated with vaseline have been found to be efficacious.

Slight pressure, immobilization and slight elevation of the part with application of heat to maintain constant temperature are all valuable. After drainage has been applied, the wound should be left alone as long as possible but not forgotten.

Early skin grafting is the rule, if grafting is indicated. Early motion and warm baths are also justified.

General resistance should be built up and a routine administration of gas gangrene and tetanus antitoxin is part of the program. The fluid balance should be controlled. Vitamins A and B are especially valuable. In fracture cases, a quart of milk is given daily to maintain calcium intake.

In summary, foreign material should be removed, the part properly cleansed, elevated, and cultures taken. It is believed that there is no need for the use of antiseptic solutions.

DR. GEZA DE TAKATS gave a paper on the subject "Postoperative Thrombosis and Embolism." Three factors predisposing to postoperative thrombosis were discussed, namely, hemoconcentration, slowing of venous return and meterologic influences. Preventive measures are possible against the first two of these factors. The early signs and symptoms were described together with the early treatment, the objectives of which are the freeing of the limb from postoperative edema and the protection of the patient from propagating thrombosis and embolism. The necessary period of immobilization following thrombosis was defined. The treatment of late sequalae of deep thrombophlebitis was discussed. In regard to embolism, the factors precipitating it, the early diagnosis and the early treatment have been stressed. Attention has been called to reflex nervous mechanisms, the inhibition of which may be life-saving. The treatment of the slowly fatal embolus and that of recurrent embolizations was discussed. While thrombosis and emboli are unavoidable, their early recognition and treatment may diminish mortality and morbidity.

DRS. JAMES J. CALLAHAN and CARLO S. SCUDERI spoke on the subject of "Treatment of Compound Fractures."

The principle of handling compound fractures in the simplest possible manner has been followed in the clinics of DRS. CUBBINS, CALLAHAN and SCUDERI. This starts with cleansing and removal of hair and dirt around the edges of the wound; careful scrubbing and cleansing of the wound itself with normal salt solution follows; a complete and accurate debridement with removal of all dead tissues and detached fragments is next in order. If bone is soiled, it should be scrubbed with a brush or the soiled area chiseled out properly.

A loose closure is performed with stitches one inch apart so that the extravasated fluid may continue the cleansing process. No drain is used.

An important consideration is frequent changing of dressings during the first 72 hours. No washing of the wound is to be done. Immobilization is practiced and in leg compound fractures, skeletal traction in the os calcis is the rule.

DR. CHESTER R. ZEISS concluded the Surgical Section program, speaking on the subject "Treatment of Burns."

The objectives of burn therapy should be to relieve pain, prevent excessive loss of body fluid, reduce absorption of toxins, hasten separation of dead tissues, prevent or minimize scar tissue formation, minimize surface infections, and promote prompt healing.

In the experience of the author a modification

of the Ambrine technique has been used successfully. The materials needed are inexpensive and consist of a paraffin with a low melting point, a double boiler, a water jacket atomizer, a fan, a camels hair brush, thin sterile cotton, and absorbent or cellucotton.

The advantages of the paraffin wax treatment may be outlined as follows: (1) relief of pain immediately or within the first 24 hours; (2) a shortening of the period of toxemia; (3) minimizing the chances of infection; (4) the promotion of rapid healing; (5) a minimum production of scar tissue; (6) the attending surgeon may easily be aware of any change occurring at the site of the burn.

An excellent technicolor motion picture was used to illustrate the various points in the technique.

Medicolegal Typing of Occupational Disease Cases

—With Four Illustrative Case Histories—

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Chicago

THE increasing number of states which have passed, or have under consideration, legislative provisions for the compensation of disability due to occupational diseases has stimulated scientific interest and effort, not only with respect to the diagnosis and evaluation of disability from occupational diseases, but what is more important, a more critical application of sound information with respect to etiology.

Previous experience over an extended period of time with medicolegal cases of occupational diseases very well indicates that many physicians have viewed such instances as purely diagnostic problems and have had little or no consideration for the etiological background in industry. This approach to the problem may be sufficient for the practitioner who is interested only in the diagnosis and treatment of cases, but it rarely ever measures up to the standard necessary in the appraisal of the various factors which must be considered in the adjudication of compensation claims. For example, it is an ordinary experience for the physician to accept the patient's statement that he was exposed to lead and, therefore, there was a lead hazard present in his occupation, simply because lead was being used or handled. However, the employer takes an entirely different point of view and in such instances is not very well satisfied with the physician's appraisal of the etiological relationships. Certainly the employer does not want to pay and cannot be expected to pay for something which did not originate in the industrial environment of his place of business; contrariwise, the employee is certainly entitled to compensation for disability arising from a true occupational disease, if contracted in the working place of his most recent employer.

Prepared for the Annual Meeting of the Central States Society of Industrial Medicine and Surgery, Peoria, Illinois, May 21, 1940.

Any critical analysis of a medicolegal problem in occupational disease involves a consideration of all of the aspects of the occupational disease problem as a whole, including:

1. The measurement and evaluation of the employment exposure by accepted and scientific industrial hygiene methods, and not mere speculation on the type or extent of such exposure.
2. The interpretation and application of the medical findings, including the results of examinations, x-ray films, clinical laboratory analyses, and the like, in the establishment of definite diagnosis and in the consideration of differential diagnosis.
3. The correlation of the industrial and medical information in terms of cause-and-effect relationships.
4. Due consideration for legislative provisions.

In establishing a clear relationship between employment, disease, and disability which is necessary in any meritorious claim, the following questions must necessarily be answered in considering the merits of each individual case:

1. Do the working conditions under which the employee labored represent an actual occupational disease hazard?
2. Has the employee a characteristic occupational disease as claimed?
3. Was the occupational disease in question contracted while working for the employer against whom the claim has been filed?
4. Is the employee disabled from the effects of the occupational disease which he alleges to have?

It is obvious that the factors involved in the medicolegal consideration of occupational diseases present a situation which is far more complicated and intangible than in instances of industrial injury. When a man is injured, except in unusual cases, it is fairly easy to trace the cause of the injury and it is far more easy to demonstrate disability than is usually true in instances of occupational disease. A fracture, for instance, a rather common form of industrial injury, is much more easily demonstrated and disability is much more easily seen, than in a case, for example, of lead poisoning.

It has become evident, therefore, that one needs a guide as to the various possibilities which may result from different combinations of the factors of employment, disease, and disability. It is therefore, the purpose of this paper to point out case types which may occur through different combinations of these variables and also to illustrate these case types by case histories selected at random from actual practice. The following table shows the possibilities in tabulated form:

	Case Types			
	I.	II.	III.	IV.
1. Employment exposure positive.....	X	O	O	O
2. Claimant has occupational disease	X	X	O	O
3. Claimant is disabled.....	X	X	X	O

By referring to this table, it is easily seen that in Case Type I all of the requirements are satisfied for a meritorious claim. In Case Type II, the

employment exposure was not sufficient to cause an occupational disease, but the claimant has an occupational disease which he contracted elsewhere and is disabled from that disease. In Case Type III, while the employment exposure was not sufficient to produce an occupational disease, and the claimant does not have an occupational disease, he is disabled because of a non-occupational disease and, therefore, under the existing principles, the employer should not be held liable. In Case Type IV, it is seen that the exposure was not sufficient to cause the disease, the claimant does not have an occupational disease, and he is not disabled, which is clearly a case where the employer has no liability.

Case Histories

THE following case histories illustrate the different types of possibilities that have previously been explained.

Case Type I—F.G., age 26, was engaged for 14 months in using benzol cement and working on a laminating machine which made use of benzol in the cement and also as a cleaner. The atmosphere contained more than the permissable amount of 100 parts of benzol per million parts of air at different places throughout the workroom.

For five months, the claimant had been dizzy and weak, had soreness of the muscles, purple blotches on the skin and a skin eruption on the back and the abdomen, and bleeding of the gums. Blood examinations showed an anemia and he had been put on a special diet and had been given two transfusions. Meanwhile he had lost 14 pounds in weight and had become so weak that he had not been able to do light work in another department.

When he presented himself for recent examination, there was a yellowish cast to the skin and a bluish cast to the whites of the eyes. The mucous membranes were pale and there was one small subcutaneous hemorrhage over the middle of the right collar bone. The blood examination showed the remarkably low white cell count of 950 per cubic millimeter and the red cells numbered 2,280,000; hemoglobin was 54% and the color index was 0.76. A severe anemia was thus apparent.

Shortly after this examination the patient was put into the hospital for observation. Smears of bone marrow were taken to exclude malignant disease. Liver extract was given by mouth and injection of liver extract intramuscularly. X-ray treatment was given over the long bones and blood transfusion was done.

Apparently none of these things did very much good, as finally, two drugs called Lextron and Reticulogen were used to good effect over a period of almost two months.

On leaving the hospital after two months of treatment, the red cells numbered 3,500,000 and the hemoglobin was 80%, and the man had gained 10 pounds in weight. Only one reading of the white cells was made about nine days after leaving the hospital, when they number 4200.

The man was then treated twice a week on office calls and was finally discharged approximately seven months after the beginning of his hospitalization, with red cells numbering 5,000,000 and hemoglobin of 90%.

This man has been at work ever since in the same organization, but not exposed to benzol. He was paid 22-1/7 weeks' compensation, totalling $288.96 and was also given a lump sum settlement of $300.00, making a total of $588.96. The medical treatment in this case cost $544.71, thus making a total cost of $1133.67.

Case Type II—P.N., age 48, had been occupied at granite cutting for approximately 35 years. During most of this time (up to 1935) there had been no protective devices used in his occupation.

His last employment for four and a half years involved no cutting processes and an occupational dust study revealed not only the absence of a silicosis hazard, but conditions which are comparable to clerical occupations.

Medical examination showed him to be short of breath and weak on exertion, with the loss of 30 pounds in weight for the past two and a half years; he had an intermittent cough and raised a great deal of sputum which was negative for tubercle bacilli on eight consecutive examinations; guinea pig inoculation and culture tests were also negative for tubercle bacilli. The sputum, however, contained other types of bacteria. The x-ray films of the chest showed findings of a moderately advanced silicosis with evidence of infection.

He was totally disabled as confirmed by clinical and laboratory examinations.

The case was tried in a common law court and a jury awarded a verdict of $5000.00, although the last employer was not proved liable.

Case Type III—J.A., age 24, operated an automatic machine in a metal products manufacturing company for almost five years.

An extensive industrial hygiene survey involving measurements of organic solvent vapors failed to show any occupational disease hazards associated with the working conditions.

Medical examination showed a chronic tuberculosis of the right lung with a cavity in the upper lobe; compression was maintained by a succession of pneumothorax treatments. The patient was ambulatory and had gained weight. The sputum having once been positive, had become negative. The cough had disappeared and there were no other symptoms.

This patient, however, was totally disabled at the time of this record.

This case was dismissed because of repeated requests for continuances by claimant's legal counsel.

Case Type IV—A.J., age 47, had worked for almost five years handling a vulcanized rubber compound containing lead before vulcanization.

Industrial hygiene investigation disclosed no lead hazard in his employment.

Previous medical examinations yielded the information that the patient had been a plumber for several years. Various diagnoses, including duodenal ulcer and lead poisoning had been made

in a university clinic. Periodic examinations of the urine had shown impossible amounts of lead due either to contamination or faulty chemical technique.

Recent medical investigation disclosed indefinite symptoms with no apparent or real correlation with physical findings. There was no clinical or laboratory evidence of lead effects (this included a neurological and psychiatric examination, which were both negative in all respects). There were no objective physical findings of any disability.

It was explained to the man that he did not have lead poisoning and that he was not disabled. The employer agreed to pay nine months' temporary total compensation; the employee returned to work October 16, 1938, and has been there ever since.

Summary

THE necessity of establishing a definite and direct relationship between employment, disease, and disability in compensation claims has been demonstrated in this paper. Likewise, the combination which these three factors may assume has been illustrated by case types, and examples given of case histories corresponding to the four case types described.

These experiences show the difficulty of securing an adequate diagnosis of occupational disease in an apparently well regulated university clinic and also the difficulties presented in getting due consideration of differential diagnosis from general practioners in the solution of occupational disease problems.

It has also been shown in this discussion how difficulties may arise in getting adequate laboratory examinations, on account of improper technique or on account of contamination of vessels in which samples have been taken for examination.

A very definite essential in the preparation of medicolegal cases of occupational diseases is a careful correlation of the history and symptoms with the objective physical findings in the estimation of disablement and a rating of disability.

In two instances it was definitely pointed out that through the use of proper procedures, the employee may become rehabilitated and return to work with a minimum loss of time.

Last but not least, it should be emphasized that adequate and critical medicolegal procedures promptly adapted to occupational disease problems will shorten disability periods and save time, money and men to the employer.

Mouth and Throat Disorders

—Clinical and Laboratory Observations of the Influence of Combined Local Anesthesia and Antisepsis—

E. MARKEY PULLEN, M.D.

THE common head and throat cold is one of the most vexing problems with which people in all walks of life have to contend. It is only too well known that it causes a great loss of time and money. Every acute cold, uncomplicated as its course may be, not only interferes for a number of days with the work and leisure of those afflicted, but it may be followed by a longer period of chronic inflammation, and moreover, in factories and office buildings, and in the homes, many cases of chronic pharyngitis are evoked or maintained by the inhalation of dust, gases, drought, chemical fumes, as well as by sudden changes in temperature. Insurance companies have conducted extensive research in hope of finding a real remedy for the common cold, and the step is in the direction of preventive medicine. Many large industrial and commercial organizations, therefore, require their employees to have a periodic medical examination. Physicians naturally prefer to treat acute colds and sore throats in the very beginning whenever possible. Yet many of them are doubtful if there is any method to produce prompt relief, and are not far from many a layman's standpoint that, "when untreated, a cold lasts seven days, whereas, under the treatment presently available, its duration is only a week."

Considering this unsatisfactory state of affairs, we believed it worth while to begin with the general problem as to whether it were possible to examine, in clinical observations, the degree of effectiveness of procedures for the treatment of "colds."

In planning clinical experiments of this kind, our leading considerations were as follows:

In view of the lack of any dependable systemic etiotropic cure, we decided to examine the influence of a suitable local treatment. Thereby it was considered as the main task not to rely upon any inconclusive "general impressions," but to register only those variations in the manifestations which can be satisfactorily evaluated with respect to their intensity. Symptoms of acute as well as of chronic pharyngitis which appeared more or less appropriate for this purpose, were recorded at suitable intervals of time and statistically evaluated in sufficiently large groups of patients.

The choice of the treatment to be observed in this clinical experiment was governed by the idea that employing one and the same remedy throughout should be preferable to dissipating the observations by the indiscriminate use of various procedures. Since there are two main objectives of any local treatment of acute chronic as well as throat inflammation, (1) relied from pain and irritation and their consequences, and , (2) if possible, antiseptic measures to depress and shorten the infectious process, we restricted the present experiment to the use of a combined local anesthetic and antiseptic. We were not primarily concerned with the problem of which special representative of these two pharmacological groups should be selected, nor with the particulars of how the two pharmacological factors should be combined, but before all with the consideration that the remedy should guarantee, according to its pharmacology, a maximum degree and an optimum type of local anesthetic action and a convincing degree of anti-

septic effectiveness. It was, however, desirable to have these two properties combined in a single remedy, and in such a form as to be consumed by every patient of the group without reluctance and to be locally effective for a suitable period.

The latter requirements call for a lozenge of pleasant taste which should release the active principle over a period of 10 to 15 minutes. For the more basic properties of this local agent we believed it appropriate to raise the following requirements: (1) As to effective local anesthetic action, an anesthetic potency of the order of cocaine and, if possible, a longer persistence of the anesthesia than in the case of cocaine; (2) As to effective antiseptic action, in terms of the United States Department of Health, a phenol coefficient high enough to secure bactericidal effectiveness in the local body fluids which dissolve the lozenge and carry the antiseptic principle.

After we had found a preparation which we believed to comply with these requirements, we employed it along the above developed lines in two groups of patients. A survey of the observations made under this plan prompts evaluation of the results based upon the low percentage figures:

First, they show that transepiglottic cough is not at all influenced, i.e., that neither does the local anesthetic contact directly any site within the respiratory tract proper, nor is the local anesthetic or the antiseptic capable of indirectly influencing the factors which are responsible for laryngeal, tracheal or bronchial cough.

Still more important are those low percentage figures which pertain to redness of the affected areas in the case of acute, and to hoarseness in the case of chronic, pharyngitis. They demonstrate that in at least 68% of the acute, and 66% of the chronic cases of the group the disease was serious enough to persist, with respect to those most obstinate manifestations, for more than 48 hours from the beginning of the treatment; in other words, that the bulk of the patients chosen for our statistical experiment resulted from a rather strict selection of only convincingly unambiguous cases.

These figures, therefore, can be used as figures of reference for evaluating the high percentage results. These latter, in the acute group, pertain to soreness, radiating pains, pharyngeal cough, and its consequence, the aching of the auxiliatory muscles. These symptoms were found definitely soothed subsequently to one single dose in at least 80%, 62%, 57%, and 53%, respectively, of those cases in which the anatomical manifestations of the disease persisted more than another 48 hours; likewise, in the chronic group, one single dose was found capable of favorably influencing the sensations of dryness and those of foreign body, the stimuli to hack and to expectorate, and the hoarseness, in at least 63%, 61%, 75%, and 59% of the more obstinate cases of the group, and cough and sensation of foreign body were completely abolished by a two-day treatment in at least 30% and 37% of those more serious cases.

From the nature of those symptoms, which were so favorably influenced, the conclusion has to be drawn that the results of our observations indicate, before all, an impressive local anesthetic effectiveness of the treatment chosen. Whether these results are also the expression of an antiseptic action is difficult to decide, since there are no means to find out if the course of the underlying infection has really been shortened in the individual case, through a local etiotropic influence. This could only be decided by parallel experiments in which the antiseptic component was omitted, and would, therefore, have required another group of a similar number of cases.

Theoretically important as an answer to this latter problem of the effectiveness of an even strong antiseptic may appear, it is of minor importance, in view of the practical result, that, under the treatment chosen, the course of the disease was short throughout, and a high percentage of the patients were immediately relieved of their most disturbing symptoms.

We believe that the above observations deserve publication first because generally they are examples of how one can collect, rather conclusive numerical information from a clinical material of this type. In addition to these technical suggestions, we believe it justifiable to draw attention to the factual result of the application of the statistical method suggested, namely to the result that, in acute as well as in chronic pharyngitis, local administration of a suitably chosen local anesthetic and antiseptic drug leads to therapeutic results which can be evaluated numerically. In the case of the present observations this favorable result was connected with the use of a preparation, (1) whose local anesthetic threshold concentration in the rabbit's eye was experimentally determined as 1:5000, whereas in a concentration of 1:1000 a complete anesthesia is obtained for as long as 58 minutes, as compared with less than 30 minutes duration after 1:200 of cocaine, (2) whose antiseptic action is determined by a phenol coefficient as high as 62 and a bactericidal threshold concentration of less than 1:18,000 against streptococci and pneumococcus, 1:72,000 against B. diphtheriae, and less than 1:9000 against staphylococci and B. Welshi, and (3) which was made up in lozenges with a time of dissolution of between 10 and 15 minutes.* In other words, the results here presented were obtained by the use of a drug with an exceptionally strong, persistent and penetrating local anesthetic action and with a considerably high antiseptic potency. It is open for a future application of the same method of evaluation to other local anesthetic and antiseptic preparations, especially to those weaker anesthetic throat tablets and lozenges which are most generally used, and to parallel experiments with the use of the same vigorous local anesthetic, but under omission of the antiseptic component, to find out if the preparation chosen for the present experiments can be substituted by those hitherto more commonly used throat preparations, and what is the part

* The preparation is on the market under the name "O R 95" Medico Chemical Corporation of America.

played by antiseptic components in the present and in other such throat lozenges.

The Electrocardiogram

—*Value in Physical Examination*—

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THERE are undoubtedly many members of this audience who have seen during their medical lifetime the entire development of electrocardiography as we now know it. This important aid to diagnosis is of comparatively recent origin and has rapidly attained an unusually prominent and almost indispensable place in our modern diagnostic armamentarium.

The recent development probably owes its beginning to the demonstration by Kolliker and Müller[1] in 1856 that electrical currents were produced by contraction of the frog's heart. This procedure remained a laboratory experiment for 30 years when Waller[2] showed that currents developed by the human heart could be measured by means of electrodes placed on the outside of the body. It is of interest to note that Waller used the chest or direct leads which in recent years have returned to general use as lead IV.

Waller used a capillary electrometer, and as the mercury column moved up and down with variations in heart current he photographed these movements and thus obtained a record of the electrical phenomena incident to the heart beat. The instrument did not produce records which were easily interpreted and the procedure continued to remain a physiologic experiment and did not gain wide clinical usage. After the turn of the century, however, Einthoven[3] demonstrated that a string galvonometer could be used to accurately record cardiac electrical activity. His instrument consisted of a thin silver coated quartz fiber suspended in a magnetic field. If current were passed through this galvonometer it caused deflection of the string and by magnifying this movement and photographing it much as Waller had done with his electrometer a very satisfactory record could be made. Variations and improvements of this principle have led to our present day machines. It is of interest that Einthoven is usually considered the father of electrocardiography but the ground work was actually laid by other laboratory workers before him.

The medical profession was quick to appreciate the clinical importance of Einthoven's announcement and very soon machines began to appear on the market and to be installed in hospitals and clinics throughout the world. Development was rapid and the importance of this new procedure in evaluating the cardiac arrhythmias was immediately recognized. However its worth in the recognition of other cardiac abnormalities came more slowly. As is usually the case in a new science, important points were overlooked and insignificant ones stressed. The interpretation of tracings fell into the hands of many who were poorly qualified to make these interpretations and too often led to unwarranted discredit of the procedure. All this has gradually changed, however, until now we have portable, easily operated machines which can be used in the office or the patient's room.

Accumulation of a vast amount of clinical data has given us a basis for our interpretations, and universal instruction in the subject in medical schools has done much to acquaint the medical profession with the merits and limitations of this valuable laboratory aid. To appreciate the value of the electrocardiogram it is necessary to consider what the various components represent, and in this way it is easier to understand what a tracing can and cannot tell us.

Each cardiac contraction is preceded by an impulse arising in the sino-auricular node and proceeding, if not in an entirely orderly fashion, at least by a definite one through the conductive mechanism of the heart. The spread of this exitation wave through the auricles is accompanied by a deflection of the string which when recorded has been arbitrarily termed the P wave. Its duration is something less than 0.2 second, before the impulse transverses the auriculo-ventricular node and begins passage through the bundle of His and the Purkinje fibers to the ventricular musculature. This stage of the cycle normally results in a large deflection of the string which when recorded has been termed the Q R and S waves, requiring up to 0.1 second for completion. At the end of this period the ventricles go into complete contraction and electrical activity is at a standstill. Then comes the final deflection of the string, resulting in a lower blunt wave which has been called the T wave. Exactly what it represents is not certain. It has been explained as being the result of repolarization of the ventricular muscle and more recently by streaming potentials the result of ventricular contraction. Whatever its cause we know that in certain clinical conditions variations in its contour are of great aid in diagnosis. By attaching electrodes at various sites on the body, namely, the two arms, the left leg and the chest wall, we are able to measure the changes in these electrical potentials at various angles.

When we use this basic explanation for the electrocardiogram it will be noted that it has to do primarily with the conduction system of the heart, that the endocardium enters only indirectly into the picture. Immediately some of its limitations will be seen. At once we can see that it is of great value in the recognition of the arrhythmias but that it can give little information concerning valvular heart disease per se.

Thus it tells us where a rhythm arises, is it sinus or ectopic? And if the latter is it from the auricle or the ventricle? What is the rate, and is it regular or irregular? Similarly it tells us whether the conduction system is intact or whether there is blockage somewhere along the line. If there is some block, where it is located and whether it is

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* Read at the Fiftieth Annual Meeting of the American Association of Railway Surgeons, September 11, 1939.

complete or partial. This is often the only means by which we can ascertain these facts. By compilation of data on thousands of cases we have come to recognize changes in the T wave as representing damage to the myocardium and many times to determine its site. We are able to follow the progression or regression in diseases affecting the heart and often to prognosticate an outcome.

BUT there are many things we can't do. We can't diagnose valvular incompetence. We can't tell for a certainty the size and shape of the heart nor what its reserve or functional capacity might be. Above all the electrocardiogram cannot take the place of a careful history and physical examination.

With these facts in mind we can proceed to a consideration of what etiological factors and in what age groups the electrocardiogram is of most value. It seems apparent that it is of more value in the degenerative types of heart disease than in the infectious. If an infection happens to damage the heart directly as for example in heart block, the result of rheumatic fever, the electrocardiogram will correctly indicate this condition and will, if repeated from time to time, give valuable information concerning the progress of the condition and the residual damage remaining after clinical manifestations have disappeared. If on the other hand the infection affects the endocardium without appreciable involvement of the conduction system the electrocardiogram may be of little use from either a diagnostic or prognostic standpoint. An extensive infection or toxicosis may make no other impression on the electrocardiogram than to increase the rate. In this instance it is only of negative value in that it shows no damage to the conductive system. Since it is of less value in heart disease directly the result of infection one would expect it to yield the least diagnostic aid in young individuals, and that is precisely the case.

In 1926 Ferguson and O'Connell[4] did routine electrocardiograms on 1812 midshipmen. These could be considered an ideal group for such investigation since they were all young adult males who had no demonstrable symptom or sign of heart disease. They had all been examined carefully prior to their admission to the service and were all able to carry on the rigorous life prescribed for them. According to the report of these authors, 944, or 52%, could be considered entirely normal, while 48% deviated from normal in some respect. A careful study of their results, however, shows that what they considered as deviations at that time might be considered normal by a less rigorous classification. For instance, left axis deviation was considered a departure but could hardly be classified as such today.

The authors were of the opinion, because no clinical evidence supported the electrocardiographic findings, that routine graphs were not of value in examination of men at this age, a conclusion which might be questioned since there was no follow-up and therefore no way of knowing whether over a period of years clinical signs and symptoms appeared to substantiate the laboratory diagnosis. However the figures certainly were not as startling as some compiled by insurance companies in regard to the more advanced age groups.

Recently Crawford[5] reported in the Proceedings of the Life Extension Examiners on 1000 consecutive standard lead electrocardiographs taken as a part of a routine periodic health examination. These were for the most part business and professional men, had all been considered insurable risks, and none gave a history of recent illness. They are, therefore, a good group for comparison with the figures obtained on the younger midshipmen. The results are quite different. It was found that normals occurred in 36.6% of the series, and their criteria were more liberal than in the previous report. For instance they considered as borderline such deviations as questionable, though definite, changes in the S-T segment and low or isolectric T waves in leads 1 and 2. The most common abnormality was a deep Q wave in lead 3 according to Pardess' rule of 25% or more of the widest excursion in any lead. Less frequently they found widening of the ventricular complex and inversion of the T waves in leads T or ii or both. Delayed A-V conduction time occurred with considerable frequency.

The most interesting and instructive result however was the manner in which the incidence of definite signs of impairment increased with age. In the age group from 10 to 19 years, no noteworthy deviations from normal were noted. At the other extreme the group between 70 to 79 revealed definitely pathological graphs in 41.2%. The first large increase took place at 40 years where 18.6% showed abnormalities. Another sharp increase took place at age 60 where 33% of those examined were not normal.

From these figures it is obvious that since nearly one out of five apparently healthy males past 40 show definite cardiac damage by means of the electrocardiogram that this procedure should be given careful consideration in the routine examination. Especially since the test is no longer a difficult or expensive one.

Insurance companies have been quick to grasp the value of this aid particularly where sizable risks are involved.[6]

The discovery of hypertension at any age is an indication for a thorough investigation of the heart, of course including an electrocardiogram. Very frequently otherwise unsuspected pathology will be revealed by such an examination.

It became evident at an early date that even though the main conduction pathways might not be involved that a coronary occlusion resulted in changes in the electrocardiogram which could be diagnostic. At first it was thought that a large percentage of coronary accidents resulted in no typical changes, however, we have revised this view and it now seems probable that a very small percentage will be missed if a sufficient number of graphs are made and at the proper time. Under ordinary conditions the electrocardiogram is char-

acteristic of an individual. It is possible to alter its appearance by such measures as drinking quantities of ice water, smoking, etc., but ordinarily the character of the record remains constant. Deviation is evidence of active pathology. Evidence of a coronary occlusion may not appear at once but may wait several days before becoming diagnostic. Particularly is this true of small occlusions occurring in so-called silent areas. Not infrequently a gastric attack with slight substernal distress appearing in a middle aged man will disappear in a matter of hours and no immediate diagnostic changes will appear in the graph. If repeated a week later however, the electrocardiogram will reveal enough variation to cinch a diagnosis. The importance of such a discovery is obvious. If a patient suffers a suggestive attack no matter how slight, a single electrocardiogram should not suffice but it should be repeated in several days, preferably a week. It is surprising how often an otherwise uncertain diagnosis can be definitely established.

I HAVE elsewhere[7] cited the case of a workman who entered the hospital dyspneic, cyanotic and edematous, in short markedly decompensated. His history was that he had worked as a laborer the previous day without distress of any sort and had enjoyed a full night's sleep. Awakening in the morning he found that the exertion incident to dressing produced marked dyspnea and when he looked in the mirror he noticed that his lips were blue. By the time breakfast was over he had developed a cough and when admitted to the hospital in the afternoon dependent edema was present. An electrocardiogram at this time revealed a typical coronary curve. Yet he had never suffered any pain. It is quite conceivable that had this occlusion been slightly smaller so that decompensation did not at once appear that he might have returned to manual labor and perhaps at a slightly later date died of a ruptured myocardium. The literature contains many accounts of silent or nearly silent coronary occlusions. We have come to realize that an occlusion need not and in fact usually is not accompanied by the major signs of shock; that minor occlusions frequently occur with few symptoms. So that we have come to be alert for any suspicious event which might indicate a cardiac accident, particularly in patients past 40. An electrocardiogram is usually available and should always be used as a valuable aid in arriving at a diagnosis.

TO SUMMARIZE: The electrocardiogram can be considered the third most important part of an examination of the heart, coming immediately after the history and physical examination, which it cannot replace but which it can ably augment.

It is a measure of the electrical phenomena occurring in the heart and is therefore concerned with the conduction system. As a result it is of most value in detecting damage in degenerative heart disease and consequently offers increasing aid as the age of the patient increases.

No investigation of the heart itself can be considered complete without an electrocardiogram and no routine examination of a patient over 40 can be considered complete until the information to be offered by this procedure is obtained. Its aid should always be sought where there is an elevated blood pressure or where there is a suspicious history, particularly when the individual is responsible for the safety of others.

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Salt for Industrial Workers

SYMPTOMS of heat cramps are described in the Bible. Military records of campaigns of Frederick the Great show that soldiers suffered from this malady. So did gold miners of Virginia City, Nevada, in 1878. But only in comparatively recent years has industry taken steps to control the industrial hazards of heat cramps, and the strength-sapping, production-lowering effects of heat fag on all who do hot, heavy work.

For years it has been known that men on particularly hot jobs, as in steel mills, gas retort houses, mines and quarries, were subject to severe abdominal cramps and exhaustion. Industrial management has long been troubled by lowered efficiency and production slumps in hot weather. The attitude was that heat was responsible — and little could be done about it.

THE attention of science was focused on the problem by experiences during construction of the Boulder Dam. In the summer of 1931, 17 cases of death were attributed to heat, and many less severe cases were treated. In the summer of 1932, John H. Talbot and Jost Michelsen of the Fatigue Laboratory, Harvard University, went out to Colorado to study the problem. In their report they showed clearly that heat cramps are caused, not directly by heat, but by loss of salt from the body through excessive sweating. They state: "Heat cramp is essentially an occupational disease, and an industrial hazard is created by the

association of hard work, high external temperature and profuse sweating."

IN 1934, the same same group of scientists who investigated heat cramps at Boulder Dam conducted research at the Youngstown Sheet and Tube Company plant at Youngstown, Ohio, and with essentially the same findings. As a result of their work, a booklet was prepared for the workers by P. M. Kennedy, M.D. It positively states that salt will both prevent and cure heat cramps.

Salt was added to the drinking water of the men in the sheet mill, at the rate of one teaspoon to a gallon. This statement of results is made: "Before we put salt in the drinking water . . . this department contributed 90% of our Campbell Hospital heat cases. Since putting salt in the water . . . we have not had a single heat case from this department, but have had quite a number from the other departments that do not have salt in the drinking water."

Another example of the effect of salt is found in figures published in *Gynecology and Obstetrics* (February 15, 1936). Plant A, employing 8,800 men, between 1926-28 had 803 heat cases and two deaths. There was no salt treatment during this period.

The same plant supplied workers with salt-dextrose tablets in 1933-35. In this period, in 7,800 workers, there were only 196 heat cases, and no deaths. The cases were much less severe.

FROM the cases mentioned here, and from a mass of other evidence, it is clear that heat cramps are caused by a lowering of the body's salt supply, through profuse sweating . . . and that this condition can be corrected very simply by providing workers who sweat with additional salt to make up the loss.

This can best be done by regulating the amount of salt to the amount of water the workers drink. Those who sweat a great deal will drink more water, and get more additional salt than workers who do not sweat as much, and consequently drink less water.

In general, there are two ways this salt can be supplied. One is to add it directly to the drinking water. Many of the earlier articles on the subject mention this method. Later evidence seems to favor the use of salt tablets. One 10-grain tablet, taken with a drink of water at frequent intervals during the day, is found to be an effective means of maintaining the normal salt balance. This method gets the desired salt into the system without affecting the taste of the water or creating excessive thirst.

MOST industrial physicians and surgeons have concluded that the correct amount of salt for the average worker to take during the day is one teaspoon of salt (or its equivalent in salt tablets) for each gallon of water he drinks. Eight 10-grain salt tablets are almost the exact equivalent of one teaspoon of salt.

Workers doing average hot work will drink about one gallon of water per day.

Workers doing the hottest, hardest work seldom drink over two gallons of water per day.

Workers doing light to medium work, 5 to 6 tablets per day.

Workers doing medium to heavy work, 8 to 10 tablets per day.

Workers doing extra heavy, hot work, 12 to 15 tablets per day.

Healing of Wounds

—Past and Present—

John A. Hunnicutt, Jr., M.D.,
Athens, Georgia

MAN and all forms of animals and plant life have possessed through the countless ages healing forces which are used to repair defects caused by injury or disease.

The so-called art of wound healing dates from antiquity. Some of the gods of mythology were endowed with the power of miraculous wound healing. If man has progressed in this art it has been accomplished by the close study and application of the laws which have remained unchanged through immeasurable years.

The healing mechanism originated in one cell organisms, the lowest forms of animal and plant life. We see nature's masterpieces in hardly visible scars which have replaced ghastly wounds.

As nature's laws are unchangeable, the modern brilliant results in surgery have been acquired through strict adherence to natural principles in tissue healing.

Nature's forces were thoroughly understood by Ambrose Pare, the brilliant French surgeon, who repeatedly made the statement, "I dressed him, and God healed him."

Pare in 1569 obeyed his King's command and treated the brother of the Duke of Ascot for a gunshot wound near the knee. This wound was filled with pus and fragments of bone. The patient was in a critical condition due to sepsis and fever.

Pare's immediate incision with thorough drainage followed by constitutional care soon restored his patient's health and healed his wound.

The restorative methods employed, so vividly presented in Stephen Paget's translation of Pare's "Journeys in Diverse Places," are identical with the best we have to offer today.

Pare's conception of the factors necessary in wound healing places him in the first rank of the immortals in surgery.

Wounds are inflicted intentionally or accidentally.

Intentional wounds are mainly those of war. The wounds we make in operations are also intentional. The former are made to kill, the latter to save lives and restore health.

It is to the great glory and credit of our profes-

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* Read at the Forty-Second Annual Meeting of the Association of Surgeons of the Southern Railway, June, 1939, Washington, D. C.

sion that none of us favors the destruction of our fellow men in settling quarrels.

Wild beasts of prehistoric times killed and wounded thousands. We still have wild beasts, called men, who would wound and kill millions.

We are not now engaged in building pyramids, but industry and the machine age in which we now live claim hundreds of thousands who receive wounds of every size, shape and description.

That we are alive at all is a source of constant astonishment. Modern man has thrown the sacredness of his body to the four winds; human life is the cheapest commodity in the world today.

Here in the United States around 50,000 are killed in accidents every year and the number of crippled or wounded amount to one million or more yearly.

In the World War 50,385 men in the American Expeditionary Forces were killed on the battlefield. That we should have so many killed and wounded in our country every year is a pure manifestation of our stupid cruelty.

When we consider the fact that this enormous loss of life is preventable we should do something about it. We doctors must appeal to our law making bodies to enact and enforce the proper legislation to stop this annual carnage.

War wounds throughout the ages have been the result of man's desire to kill his adversary quickly or slowly in the greatest agony.

These instruments of death and torture have ranged from arrows, spears, stones, fire, bullets, steel, shells, and germs to poison gas which sears the skin and respiratory passages.

THE treatment of wounds has changed from balsams, wine, salves, ointment and boiling oil and carbolic acid, to debridement or removal of dead tissue with constant irrigation and perfect drainage. The lowly magot has been used in bone infections with spendid results.

In the American Expeditionary Forces the soft tissues of the lower extremities received the most wounds — 333.86 per 1000 wounded with a fatality rate of 6.09%. The soft tissues of the upper extremities — 198.61 with a fatality rate of 4.27%.

The wounds of abdominal and pelvic organs occurred 11.07 per 1000 wounded with a fatality rate of 66.80%. Wounds of the spinal cord and vertebra had a frequency of 3.64 per 1000 wounded with a fatality rate of 55.85%. The cranial bones and brain were wounded 20.46 per 1000 men with a fatality rate of 37.11%. Thoracic organs 10.52 per 1000 wounded wtih a fatality rate of 47.68%.

General Location of Gunshot Wounds

	Percentage	
	Civil War	World War
Head	11	13
Trunk	18	14
Upper Extremities	36	32
Lower Extremities	35	40

Artillery missiles caused 70% of the gunshot wounds of the American Expeditionary Forces compared with 10% among Union troops during the Civil War.

The location of gunshot wounds during the World War was very much the same as the location during the Civil War.

PASTEUR and Lister laid the foundation for modern surgery.

Pasteur's work on the germ theory furnished the final chapter in the work begun by Oliver Wendell Holmes, Semmelweiss and Lister. He proved beyond all doubt that infections were due to germs.

The surgeons armed with this knowledge gradually changed their methods of treatment.

We have tried to eliminate all procedures which might retard the rapid per primam healing of tissue.

The pioneers in surgery were quick to observe that it was not only necessary to control hemorrhage during and after operations, but also of the utmost importance to have normal healing without infection.

Practically up until the 20th century hospitals defeated the very purpose for which they were founded. Hospital gangrene and blood poisoning so infested the hospitals of the early and middle part of the 10th century that it meant almost certain death for a patient with an open wound to be taken to a hospital for surgical treatment.

The hospitals were filled constantly with the horrible stench from necrotic suppurating wounds. Practically all wounds became infected, and in the battle between gangrene on the one hand and the natural resistance of man on the other, far too often disease was the victor, and when not victor its poor emaciated opponent was left almost lifeless. The mortality following amputations at Glasgow was 39%. The mortality from hospital gangrene at one of the hospitals in Munich reached 80% at one time.

In pre-antiseptic days no law of cleanliness existed, no law regulated the surgeons toilet. The surgeon rolled up the sleeves of his coat to save the coat, sometimes washed the field of operation with soap and water, and with unwashed hands proceeded to operate with instruments previously washed to remove blood stains. Instruments used for dressing wounds were wiped upon a piece of cloth and kept in the vest pocket.

In 1862 Pasteur showed that putrefaction was due to organisms, thus refuting the belief in the spontaneous generation of life.

In 1863 Leuwenhoeck discovered the existence of microbes.

In 1865 Lister used Pasteur's findings in explaining the putrefaction and contamination of wounds. Pasteur's discoveries caused Lister to seek measures fitted to prevent and combat the infection of wounds. His first patient was a boy of 11 suffering from a compound fracture of both bones of the leg. The wound was dressed with cotton lint soaked in crude carbolic acid and healed by first intention. He began to sterilize his hands, instruments and ligatures with carbolic acid with marked success.

Lister produced chromic gut and showed wound infection was due to the introduction of organisms. His experiment with dressing material led to the production of the bland cyanide of mercury gauze.

Lister introduced the rubber tube drainage by using this method to drain a large abscess under Queen Victoria's arm.

Professor William Stewart Halsted introduced rubber gloves in 1889. He perfected an artery clamp which bears his name, and popularized the use of black silk in operations. His meticulous, enduring work on wound healing, blood vessels, breast, goitre, hernia and intestinal operations should give him first place in American surgery.

To insure the best possible conditions for wound healing we now employ sterile gloves, gowns, instruments and field of operation, clean cut incisions with the lightest handling of tissues. Perfect ligation of bleeding points with suture material of the proper size and strength and the nice approximation of the different layers of tissue.

In order to secure satisfactory results in wound healing we must try always to make sure that no germs will be added to the wounds inflicted by ourselves and others.

The strides we have made toward rapid healing of wounds have been great. However, we still have wounds with a high fatality percentage; those of the abdominal viscera, thoracic cavity, the spinal cord, vertebra and the brain.

It is our wish and hope that in the years to come we may be able to discover ways and means of combating successfully the ravages of these wounds and reduce to a minimum the past high mortality rate.

A doctor should always be a paradox; he should forever strive to prevent the occurrence of disease and injuries from which he earns a living.

Fractures

Book Review by

FREDERICK W. SLOBE, M.D., F.A.C.S.,
Chicago

FRACTURES. By PAUL B. MAGNUSON, M.D., Chicago, Illinois. 511 pages, 317 illustrations. Price $5.00. The J. B. Lippincott Company, Philadelphia, 1939. Third Edition, Revised and Enlarged.

AS expressed by the author in his preface, the original purpose of this book was "correlating the study of anatomy and physiology to the principles of the treatment of individual fractured bones." The profession, no doubt, is quite familiar with the first two aditions. Numerous additions and changes have been made. This review will first consider these various additions.

The first change includes a new section on the immediate treatment of compound fractures. The author prefers the generally accepted soap-and-water cleansing and debridement followed in many instances by primary closure provided the patient is treated within six hours and the wound is not badly soiled. In any case that appears dubious the author prefers drainage and advises Carrel-Dakin's irrigations which are of great value.

In the section describing the use of steel plates, the author makes a plea for their standardization as to strength and method of application. He praises the Darrach type of steel plate with machine-type screws and thread-cutting ends that grip both cortices.

Concerning the pathology and repair of fractures, the author quotes freely from the report of the Fracture Committee of the American College of Surgeons of which he is a member.

The treatment of impacted fractures of the surgical neck of the humerus has been revised, abduction on the Cleary splint being preferred, with very early motion instituted. In fracture-dislocations of the head of the humerus, the operative procedure consists of manual reduction of the dislocated head after which the fracture is held in position by sutures or wires.

In fractures of both bones of the forearm the influence of the interosseus membrane and muscle pull on the displacement is stressed; and, because of the effect of displaced fractures on the function of the wrist the author holds to the belief that immediate reduction is very important and that all cases should be operated upon if the fragments of either or both bones cannot be held in normal position. Methods used in reduction include sling and traction splints, skeletal traction above the wrist joint, or open operation using either the Darrach type of plate, pegs, or screws.

A modified method of treating fractures of the lower end of the femur into the knee joint is described, consisting of manipulative reduction by leverage using initial forceful flexion of the Pearson attachment in a Thomas splint followed by Kirschner wire traction through the upper end of the tibia. Concerning intra-capsular fractures of the neck of the femur, in addition to the usual classification as to the anatomical site, the author classes them also as to angle or plane of fracture. This is of very great importance on the future prognosis as has been similarly emphasized by Lehman, King, and others. The most favorable is one type of sub-capital fracture, the head being in adduction, with a valgus deformity. These bear weight very well, the impaction remains, and an almost vertical weight-bearing line is present. Immediate ambulation is usually successful in this fortunate but unusual type. The other types, of course, require more radical treatment and the various methods of internal fixation described include those of Smith-Peterson, Johansson, Austin Moore, and Thornton and Sandison. The angle of inclination is described by diagrams as well as the angle of declination; the latter averages about 20 degrees depending upon the degree of rotation. Various reconstruction procedures are given including the author's own operation.

Discussing skeletal traction, the author has always been somewhat fearful of the Steinmann pin because of the danger of subsequent osteomyelitis and, therefore, advises the Kirschner wire.

The above include the chief changes in this edition. There are many features of this and in the previous editions, however, that deserve re-emphasis. The fundamental principles of reduction, alignment, traction, and anatomical mechanism are very clearly presented.

The chapter on general equipment, splints, and casts is excellent containing many practical pointers and very helpful diagrams. These diagrams are clear-cut views of the application of splints, traction procedures, and manipulative reductions. The author does not attempt to describe all methods used in treating a given fracture but limits himself largely to those found successful in his own extensive experience. Where open operations are indicated he describes the operation found most successful by himself. As a result the reader is not left with that element of indecision which so often occurs when one reads a voluminous treatise where so many methods are mentioned.

This book is one of the most practical of all works on fractures. It is concise and the rationale of the various procedures is readily grasped because it is written in such an understandable fashion. The extensive experience of Dr. Magnuson forms the basis for this book and it represents the conclusions that have become crystallized in his mind. Surgeons, orthopedists, and general practitioners alike will find much of great value in this book.

Industrial Medicine
Reg. U. S. Pat. Off.

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The Trend to Fixation

PROBABLY because it is long-range, and not so easily discernible as some others, the one effect of the numerous new laws regulating hours of labor, wages, and other conditions of employment which is likely to evidence itself in the most far-reaching social and economic changes is least mentioned. This is an effect of all the laws rather than any; a result of their combination—because no single one was aimed at the full eventuality of the whole series. It is conceivable however, that the combination itself might have been so intended. In the terms of those who discourse on economic subjects, this effect is the ultimate and inevitable reduction of what they call "social mobility,"—accomplished by means of the fixation of the man in the job.

Social mobility involves the freedom of the individual to develop himself and his capacities independently—to aim, if he pleases, at the lifetime goal of economic security through his own efforts and without the need of permanent reliance on his job.

That is the American way, as it used to be.

For several decades the trend has been toward the gradual endowing of the individual with a "vested right" in his job. The laws and the courts brought this into existence over a period of years, and confirmed it repeatedly, without, however, any apparent thought as to the duty of the individual to sustain with all earnestness his part of the employment contract—in other words, to *earn* his pay. Special requirements of law along that line were, of course, impossible in this country. But the result has been accomplished—within the last few years—by a combination of regulations and court interpretations affecting their operation which are effectively freezing the worker to his work by making it increasingly difficult for him to find its equivalent elsewhere. Every young man hunting a job knows jobs are hard to find. And no small part of the difficulty consists of things which every father of such a young man learns of as completely new since the long-ago day he went to work for his first pay check.

The slow evolvement, therefore, is toward fixation, and also toward a tightening of the elements of the fixation, in such ways, for example, as the limitations upon what can be earned in the place fixed—the employer tendency to eliminate overtime being illustrative. And as the fixation develops, it seems to be getting more and more difficult to "get ahead" either by thrift on the one hand or enterprise on the other. This conclusion, of course, applies to the millions who find it advantageous or necessary to stay in a job. More will find it so as the social changes of recent years exert their fuller effects and the general economic changes emphasize the added obstacles to doing anything else. The circumstances have the prophecy of a fixation of class; the employed will be the employed.

If this means anything, it means the continuous enhancement of the factors of selection which the employer will impose against the applicant for a job. And thus it means among other things the gradual tightening up of the scope and the technique of the pre-employment physical examination — in which respect it is of interest and importance to the physician.

June Meetings

THIS month has two important meetings of industrial physicians and surgeons.

The American Association of Industrial Physicians and Surgeons has its Twenty-Fifth Annual Meeting in New York, June 4, 5, 6, and 7, in conjunction with the American Industrial Hygiene Association's First Annual Meeting.

And in Charleston, South Carolina, the Association of Surgeons of the Southern Railway System is holding its Forty-Third Annual Meeting on June 4, 5, and 6.

The program of the New York meeting has been given in full in previous issues of Industrial Medicine. In the face of the precedents of the many excellences of previous programs, this one sets a high mark of its own. The complete abstract of the many outstanding presentations will be a feature of Industrial Medicine for July. That issue will also have a full account of the Charleston meeting of the railway surgeons.

It is notable that these annual meetings are, respectively, the *twenty-fifth* and the *forty-third*.

INDUSTRIAL HEALTH AND DISEASE

Absenteeism Audit

—To Cut Losses—

AIR HYGIENE FOUNDATION

AN ORGANIZED effort to reduce sick absenteeism throughout the heavy industries, source of staggering "hidden" losses to management and labor alike, is being launched by Air Hygiene Foundation. The Foundation, with headquarters at Mellon Institute, Pittsburgh, is a national organization of manufacturing and mining concerns for the advancement of industrial hygiene.

A preliminary report, "Sick Absenteeism in Industry," has just been released to the 200 member companies as the first step in the undertaking. DR. A. J. LANZA, medical Committee Chairman, points out in this report that "eight-plus days per male wage earner and 12-plus days per female worker per year is the average toll paid to disabling sickness and injury — a staggering total whether viewed from the point of health or of money loss and at least five times greater than the corresponding figure for industrial accidents."

There are three steps in the program. First, the preliminary report which has been completed and which attempts to picture the problem for management. Secondly, the keeping of records on sick absenteeism by the participating companies on prescribed forms. And thirdly, the analysis of these records, which will be held strictly confidential. This analysis is expected to yield specific ways and means whereby the participating companies can cut down their number of lost workdays through sick absences.

Cooperating with the Foundation in the study are the U. S. Public Health Service and the American Association of Industrial Physicians and Surgeons. These organizations collaborated in working out the forms to be used in recording the lost time and will aid in the analysis.

The preliminary report points to the complexity of the subject and shows that age, occupation, income, sick benefit plans, and methods of tabulating absences all enter into the problem. The report adds:

"Many employers who have never analyzed their absenteeism record would receive a shock if they were to find how frequent are absences of more than a week's duration and how many days their employees lose by such absences." Records compiled by the U. S. Public Health Service for a group of companies showed that sickness and non-occupational injuries, resulting in more than seven days incapacity, caused 96 absences among over 1,000 male workers.

Short-time disabilities lasting less than eight days are the greatest concern to industry, particularly those of one, two and three days. These are caused mostly by colds and respiratory infections, gastro-intestinal upsets and a variety of causes not clearly defined, and among females, dysmenorrhea. The important factors among the ill-defined causes are mental and emotional instability. Further, some companies find that employees with poor health records also had poor safety records.

Fatigue is an associate of absenteeism. DR. R. R. JONES, of the Bell Telephone Company, discussing this subject in the report, tells of a firm that boosted production 12% by shortening the work day by 6⅔%. This was accomplished by instituting two 15-minute recess periods, one in the morning and one in the afternoon.

DR. A. W. SCHOENLEBER, of the Standard Oil Company of N. J., says: "I know of companies which had sickness frequency rates as high as 1,500 per 1,000 which, when this matter was called to their attention, reduced the rates to 700 per 1,000 in one year, entirely through management supervision."

DR. C. D. SELBY, of General Motors, declares: "There is no point in studying sickness unless industry can and does do something about it. What can industry do? It can (1) provide safe places of employment, and it can (2) furnish health maintenance programs. These activities not only serve to prevent sickness but they likewise serve to assist employees in the early discovery of sickness and physical handicaps which, if properly treated may not become major sources of disability."

DR. R. R. SAYERS, of the U. S. Public Health Service, asserts: "I am sure that we can improve the health and reduce the absenteeism due to illness, if we know *when, where* and *how* absenteeism occurs." DR. LANZA adds: "In other words, the time for hazarding impressions is past and the time is at hand when the employer must have an accurate conception of the number and the type and the severity of disease conditions that are causing absenteeism among his workmen."

W. G. HAZARD, of the Owens-Illinois Glass Company observes: "We feel that there are all kinds of costs involved in sick absenteeism apart from the hardship and suffering; the cost of taking care of the disabled person, the cost to himself, to his family, and the cost to the company; the cost of getting a replacement; the cost of training him; the chance of spoilage of material; and the whole cost of labor turnover, which includes the cost of unemployment insurance. As your sickness goes up, you have to get more replacements and then your unemployment insurance cost goes up."

A. J. R. CURTIS, of the Portland Cement Association, describing absenteeism studies in his industry, says that "to be effective, absenteeism data must be gathered carefully, analyzed accurately, and judged in relation to comparable statistics from other sources." Others contributing to the report include DR. O. A. SANDER, consultant, and DR. C. H. WATSON, of the American Telephone and Telegraph Company.

The plan for the survey requires the filling in of a punch card* for absences and the recording on other forms the number of workers under observation. Absenteeism records will reveal the line of action necessary to obtain a maximum reduction in the amount of time lost from work through disability. They will call attention to excessive rates from certain causes and should serve to improve these conditions.

* The punch card and recording forms here mentioned were described in INDUSTRIAL MEDICINE for May, 1940, page 272.

Industrial Dermatitis

COMMITTEE ON HEALTHFUL WORKING CONDITIONS,
NATIONAL ASSOCIATION OF MANUFACTURERS

DEFINITION: Any disease of the skin due to industrial work is called an industrial *dermatosis*. That type of dermatosis caused by an inflammation of the skin is called *dermatitis* and comprises the majority of all industrial skin causes.

Because the claims for compensation due to skin damage in industrial work reported in incomplete state reports and to the Office of Dermatoses Investigations of the U. S. Public Health Service have constituted about 65% of all reported occupational disease claims, and because the economic loss to employees and

employers that arises from skin damage is largely preventable, the Committee on Healthful Working Conditions has prepared this summary of accepted medical knowledge on the subject so that manufacturers may use it as a source of reference when dealing with the dermatitis problem in their plants.

The Committee realizes that the individual hazard of each production process requires specific study and that the following information is, of necessity, general in character. Nevertheless, an endeavor has been made to treat the subject so that not only can the control of a specific dermatitis problem be set up, but that the control shall be practical.

The large amount of information on dermatitis that must be presented for a clear understanding of the subject has necessitated the use of brief, factual statements throughout the report.

Economics

REPORTS of cases of industrial skin afflictions are increasing steadily despite a decrease in other reported occupational diseases.

Dermatitis is by far the most frequent industrial disease, but the compensation cost and disability time per case is lower than for most other occupational diseases. Example follows:

Dermatitis caused 49% of all occupational disease awards in New York State in 1937, with an average compensation cost of $159 per case, and with a total of over 8,915 weeks disability time, at an average of 13 weeks per case. All other occupational diseases averaged 40 weeks disability time and $347 compensation per case.

Annually, 1% of the workers in the basic industries suffer from dermatitis at an estimated total cost of $200 per case.

Legislation

COMPLETE or partial compensation coverage for industrial dermatoses now exists in the laws of 18 states and four U. S. territories or possessions.

INDUSTRY OR OCCUPATIONS AFFECTED MOST FREQUENTLY BY DERMATOSES, AND MAJOR CAUSES IN EACH INDUSTRY:
(based on 5,980 cases)

No. Cases	Industry	Cause
712	Metal industries (except iron and steel).	Chromates and chromic acid. Metals and metal plating. Petroleum products and greases. Cyanides.
584	Iron and steel industries.	Petroleum products and greases. Metals and metal plating. Solvents (other than mineral oils).
556	Machine operators, machinists (not classed elsewhere).	Petroleum products and greases. Solvents (other than mineral oils). Synthetic resins.
437	Food Industries.	Dusts. Alkalies and their compounds. Plants (vegetables, cereals, etc.).
306	Building and construction industries.	Plants (vegetables, cereals, etc.). Solvents. Paints, enamels, varnishes.
287	Cement, glass and pottery industres.	Building cement and concrete. Dusts. Alkalies and their compounds. Petroleum products and greases.
284	Rubber industries.	Rubber and its compounds. Chemicals (unspecified).
258	Clothing and textile industries.	Dyes and dye intermediates. Dusts.
235	Chemical industries.	Chemicals (unspecified). Solvents (except mineral oils). Chromates and chromic acid.
206	Paper, printing, and allied industries.	Chromates and chromic acids. Dyes and dye intermediates. Chemicals. Solvents.
176	Leather industries.	Dyes and dye intermediates. Dusts. Solvents (except mineral oils).

IRRITANTS CAUSING DERMATOSES AS REPORTED TO U. S. OFFICE OF DERMATOSES INVESTIGATION
(arranged according to % of cases caused by each irritant)

Percentage	Irritants
12	Alkalies (including soap, cement, concrete).
11	Petroleum products.
11	Solvents (including paint, enamel, varnish).
10.5	Plants (ivy, vegetables, etc.).
8	Metals and plating.
5.5	Dyes.
5.3	Chromic acid and chromates.
3.5	Acids.
2.7	Rubber and its compounds.
1.8	Resins.
1.5	Physical agents (pressure, dry and wet heat and cold, etc.).
1.2	Biologic agents (fungus, bacteria, parasites).

Discussion

INDUSTRIAL dermatitis is the result of: (a) *primary irritants*, such as strong acids, strong alkalies, metallic salts, strong soaps, which are likely to affect all exposed workers equally; and (b) *secondary sensitization* (sensitiveness), dependent on an acquired supersensitivity of an individual's skin to a particular substance even in weak concentration.

The actual character of the skin reaction is individual in each case and may not be indicative of the type of irritant or sensitization of the person. Also, the skin reaction may be complicated by an industrial skin disease superimposed on a dermatosis which is not of industrial origin.

Dermatitis may develop on first exposure to a strong concentration of a primary irritant or prolonged exposure to a weaker concentration of the irritant. Dermatitis due to secondary sensitization develops usually after a period of exposure and during that period the individual will show no dermatitis unless the concentration of the irritant becomes so high as to act as a primary irritant. Once sentitized, however, the sensitization dermatitis will appear on contact with very minute amounts of the substance and will develop from concentrations that in no way affect a normal person.

Primary dermatitis is somewhat less frequent among dark skinned types and negroes. It is more frequent in hot weather, is usually easily cured, and has a short disability time. However, it may be the first step in the development of the secondary sensitization type.

Secondary sensitization dermatitis is much less frequent than the primary type, but may develop in any skin type and color, usually is cured with difficulty, and tends to cause a long and expensive disability. Also, severe cases frequently become sensitive to many other substances, not only at work, but outside, and become a re-employment problem. The sensitization may develop on first contact with an irritant or only after months or years of exposure, but usually there is an interval of from seven days to a few weeks of contact before the appearance of the dermatitis.

Irritants vary in their ability to cause sensitization. The following substances are known to be frequent causes of skin sensitization:

Analine dyes and intermediates
Chromium compounds
Explosives
Formaldehyde
Lacquers
Nickel
Resins
Turpentine

Early treatment by an experienced physician or dermatologist can materially reduce the extent and disability of the dermatitis in either primary irritative or secondary sensitization cases.

Cutting Oils

THE very frequent dermatitis of machinists and machine operators working with cutting oils and compounds is caused by the oil penetrating the skin and carrying in bacteria and foreign material. It can be prevented by:

1. Filtering metallic particles out of cutting oil before use. Sterilization by heat or addition of antiseptics to the oil before use may be of additional help.

2. Cleaning hands and exposed skin, and applying bland protective cream or oil before work.

Prevention of primary irritative dermatitis.

1. Maintenance of pre-employment and periodic physical examinations.

2. Prevention of contact of workers' skin with irritant.

4. Maintenance of good skin hygiene.

(a) Capture of irritant fumes or dusts at source by exhaust ventilation hoods, or use of totally enclosed manufacturing apparatus where possible.

(b) Use of acid and alkali resisting gloves, aprons, and protectors.

(c) Use of impervious pastes and creams on exposed skin.

(d) Use of clean dust-free lockers which should keep work and street clothes separate. Use of clean work clothes.

3. Substitution of non-irritant substance in production for irritant, if possible.

(a) Free use of *bland* soaps or cleansers, with adequate water at convenient basins or showers before and after work. Uncleanliness of skin is greatest predisposing cause of dermatitis.

(b) Avoidance of improper cleanser for use by the men after work (no gasoline, turpentine, fat solvents, strong alkali or abrasive soaps).

5. Investigation of any skin irritation and endeavor to correct it as early as possible, no matter how slight the case.

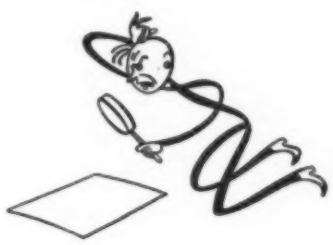
PREVENTION OF SECONDARY SENSITIZATION DERMATITIS:

1. Prevention of primary irritative dermatitis.

2. Operation of skin hazardous processes by men with normal or resistant skin, preferably without history of eczema and skin disease.

3. Substitution of compounds of low sensitizing power for known sensitizers, if possible. Observation of effects of all new compounds used in production.

4. Education of foremen, or men, in methods of prevention.



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5. Removal of man from exposure as soon as it is definitely found that he cannot get well ("hardened") under treatment while working. If necessary to remove man from work for cure, return to non-skin-hazardous job, if possible. Secure medical consultation on case, especially, if you believe it is due to sensitivity.

Acknowledgment

THE Committee is indebted to the members of its Advisory Committee and to the reports of DRS. LOUIS SCHWARTZ, E. D. OSBORNE, and J. W. JORDON, as well as to the *Journal of the American Medical Association*, in the preparation of this summary.

Industrial Practice

THURMAN H. LAUTENSCHLAGER, M.D.,
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RESEARCH in medicine is constantly striving for knowledge in the application of appropriate drugs for the relief of human suffering. I use the word suffering not only as applied to physical pain but to disability in general.

The paramount issue in the field of traumatic surgery after the relief of pain, is the attempt to reduce the period of disability to a minimum.

In the care of injuries and wounds, local applications have by far a more extensive use than medicine given internally, although medicine internally may be of particular importance in some cases. It is not my purpose here to discuss the phase of internal medication or even in combination with local treatment but to confine my subject to local applications.

All types of injury whether open or not keep the traumatic surgeon always on the alert not only because of the immediate condition, but because his experience teaches him to look into the future with the knowledge of what may present itself by way of possible complication and to use every means to prevent those complications from arising.

Obviously primary attention to wounds and injuries at the earliest time are of the greatest importance. Proper routine although comparatively simple to the experienced operator are but a sloppy mess in the hands of the inexperienced. It is well to mention that skin areas over contusions should be cleansed, but if there is oozing of blood into deeper tissue without drainage, it is not well to do any brisk rubbing.

After cleansing and the approximation of disturbed tissue in an open wound, the question of the kind of local application arises. Here the procedure is almost as variable as the number of operators and it is because of this that I present my routine in the hope that it will simplify and expedite the work of the traumatic or industrial surgeon.

A good general rule is to make open wounds clean and keep them so or to open areas likely to become contaminated and keep them clean by drainage, for a reasonable time before allowing them to close. In either instance close observation of the wound is essential and this can only be done by examining the wound and keeping it cleanly dressed. The physical cleanliness of the operators hands is a very necessary factor.

Assuming the wound is properly cleansed and the tissue approximated, a dressing either plain or medicated is applied. Some men prefer a powder dressing, some a bland dressing or a liquid astringent dressing. Iodine is still a favorite in some quarters but in improper strength it will produce harm. I have seen iodine burns that were worse than the original injury. Iodized dionol has the proper strength for full iodine value and never irritates.

After the primary dressing, in primary healing, the wound margins are usually found dry and clean but the tissue now requires a medium best fitted to prompt regeneration and healing. I find at this point a most valuable agent in plain dionol or if there is the slightest suggestion of infection, iodized dionol is indicated. Here we have a distinctly advantageous dressing because the wound area is kept soft, but not too soft. It lessens the discomfort from tension by wound clips or suture and

No. 1. Male, age 38. "I was pushing a heavy rack and my foot slipped and struck my chest against the rack." Severe contusion, right chest anterior. Traumatic myositis pectoral muscles. Treatment: Support, analgesic dionol. Disability, 10 days.

No. 2. Female, age 24. "I was cutting oranges to squeeze for orange juice and accidentally stuck my hand with the knife." Deep stab wound palm of left hand. Treatment: Wound cleansed and sutured with drain. Iodized dionol. Disability nine days.

No. 3. Male, age 34. "I was repairing warehouse roof and taking ladder down when I slipped and the ladder fell over on my hand." Severe sprain right wrist. Traumatic teno-synovitis. Possible fracture of radius. Treatment: Support, splint, x-ray. Analgestic dionol. Disability 14 days.

No. 4. Male, age 51. "I was scraping hardwood floor removing varnish and a splinter ran under my nail." Reported six days after injury. Infected puncture wound left little finger. Treatment: Incision and drainage. Iodized dionol. Disability six days.

No. 5. Male, age 19. "I was loading ice on the truck and accidentally stepped between the truck and the platform and struck my leg." Reported next day after injury. Severe contusion external lateral left leg. Treatment: Analgesic dionol. Disability five days.

No. 6. Male, age 58. "I was tying up bundles on the paper bench and the hook slipped and the door fell on my hand." Reported two days after injury. Severe contusion right hand, first and second metacarpals. Traumatic teno-synovitis extensor tendons. Treatment: Analgesic dionol. Disability four days.

No. 7. Male, age 21. "I was cutting cardboard over a ruler and the blade slipped and caught my thumb." Deep incised wound left thumb lateral vessel severed. Treatment: Wound cleansed. Bleeding arrested and sutured. Dionol dressings. Disability 10 days.

No. 8. Male, age 36. "Was cutting bread and knife went down cutting my finger." Deep excavating wound left ring finger. Spontaneous amputation of tip. Treatment: Wound cleansed and sutured to arrest bleeding. Dionol plain until granulated to proper level. Dry dressing alternate.y. Disability 10 days.

No. 9. Male, age 20. "I was cutting French bread and when I got to the heel I accidentally caught my thumb and finger." Incised wound left thumb and midfinger. Treatment: Wound sutured. Dionol after second dressing. Disability six days.

No. 10. Male, age 24. Dislocation carpus right arm. Treatment: Reduction dislocation. Splint. Analgesic dionol. Disability 12 days.

No. 11. Male, age 31. Muscle strain right erector spinae muscles. Traumatic myositis. Treatment: Support, analgesic dionol, infra-red. Disability three days.

No. 12. Male, age 18. Deep incised wound left thumb dorsal between extensor tendons. Treatment: Wound cleansed and sutured. Dionol. Disability six days.

No. 13. Male, age 34. Deep lacerated puncture wound left thumb involving joint. Treatment: Wound cleansed opened and drained. Iodized dionol. A.T.S. Disability 15 days.

No. 14. Male, age 50. Deep laceration palmar surface left index finger. Wound cleansed and sutured. Dionol. Disability 10 days.

No. 15. Male, age 37. Severe contusion to back. Traumatic myositis. Possible internal injuries. Treatment: Analgesic dionol. Disability two days.

No. 16. Female, age 18. Severe scald right upper arm. Dionol. Disability nine days.

No. 17. Male, age 63. Hot grease burn right index finger. Dionol. Disability eight days.

No. 18. Male, age 39. Laceration right index finger. Treatment: Wound cleansed and sutured. Dionol. Disability six days.

No. 19. Male, age 33. Reported two days after injury. Infected laceration dorsum right hand base of little finger. Treatment: Incision and drainage. Dionol. Disability four days.

No. 20. Male, age 37. Reported seven days after injury. Infected laceration right ring finger. Lymphangitis and axillary adenitis. Treatment: Incision and drainage. Iodized dionol locally. Analgesic dionol to lymph channels and gland. Disability seven days.

No. 21. Male, age 71. Deep laceration left index finger lateral. Treatment: Wound cleansed and sutured. Dionol. Disability five days.

No. 22. Female, age 33. Severe contusion instep right foot. Traumatic teno-synovitis extensor tendons. Treatment: Analgesic dionol. Plantar support. Disability nine days.

No. 23. Male, age 25. Traumatic myositis right rectus abdominus muscle. Treatment: Rest. Analgesic dionol. Disability five days.

permits their removal with the greatest of ease and comfort to the patient. To be able to lessen pain and discomfort to a patient means a great deal in satisfaction to any practitioner but to the industrial surgeon there is in addition a distinct time-saving element.

In my use of dionol products I have become very enthusiastic and the benefits derived, I believe, impress me with a duty to the profession to disclose my experiences. I know of no better way than to run through some cases which present themselves almost routinely and then mention a few of the more unusual cases. Accordingly I have selected from the files a number of cases appearing consecutively. (See page 322.) I have given the history of the case merely to show the routine manner of occurrence and accidental happenings which produce injury.

Contusions of all kinds and in all manner of anatomical locations are common as are also cuts and lacerations of varying degrees. I stated before that after the examination of the injury the diagnosis is made and appropriate treatment instituted.

For example, a case presents itself with a deep open wound bleeding profusely. The wound is opened to its base, the clots are removed and free bleeding controlled, deep structures are approximated whether muscle or tendon, and the wound closed with through and through sutures or clips. I exercise particular care in fascial and tendon sheath approximation. The wound is dressed and at the second dressing plain or iodized dionol is applied, as I have mentioned.

Wounds of the back of the hand and dorsum of the foot should be examined carefully because of possible tendon involvement. Sometimes the tendon is not severed but severely contused. This involves the tendon sheath which sometimes presents a ganglion later. In these injuries I have found analgesic dionol a very valuable dressing after the open wound is healed and especially valuable when this type of injury shows the skin to be unbroken.

As an application for traumatic bursitis at the knee or elbow, relief from pain and prompt absorption of fluid were noted, and under this treatment I have not found it necessary to aspirate such fluid in any instance. My conclusions are drawn from a large number of similar cases and separate case reports are not necessary.

I was recently called in consultation to see a case of acute phlebitis and suggested analgesic dionol. The attending physician informs me that the case cleared up very promptly. A light dressing was found sufficient. In contusion of the nose and even fracture I have found nasal dionol to be soothing and healing to the abused nasal mucosa. I use dionol plain and iodized in the treatment of burns and have it applied at the plant as the

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A case of unusual interest was an ischio-rectal abscess which appeared only as an extensive cellulitis when first seen. A dionol pack was used and in 36 hours an incision just sufficient for drainage was made. Several ounces of fetid pus was evacuated and flatus came through the incision. An iodized dionol drain was inserted and a plain dionol pack applied. In addition a dionol rectal suppository was inserted every eight hours into the rectum. Soiled dressings were frequently changed and I had anticipated a fistula without question. However, this case cleared up completely within seven days without the slightest suggestion of fistulous formation.

Venomin

—*In the Treatment of Arthritis, Arthralgia Neuritis and Allied Affections* —

PAUL BUTLER, M.D.,
Orlando, Florida

THE snake has always had an engaging interest to the mind of man, whether from the knowledge that certain species are dangerous; from the mystery of his locomotion; from the evil traditions which have been handed down, based upon fear, ignorance and superstition, or from whatever cause; the fact remains that until very recent years, no scienticific study was ever made in an effort to differentiate the various poisons in regard to their effects upon the human body.

From the earliest history of medicine, even from the days of empiricism, we find references to snakes as a symbol or ideal of the art of healing, as shown by the Roman Caduceus, by the pictures of Aesculapeus, Hygeia, and numerous other instances in which a snake was generally associated with the idea of healing.

In modern times, Hahneman and his followers used as a conspicuous part of their materia medica, the cobra, the lance-headed viper, the Crotalus, the water moccasin and copperhead venoms, but the regular medical profession has not until recent years entered upon a serious study of these zootoxins.

However, it has recently been proved that cobra venom[1,2] has a higher analgesic action than morphine, and many have supposed that because of the high neuro-toxicity of cobra venom that, therefore, it must have a greater analgesic value than any other zootoxin. But this is not the case. It is a well-known fact that cobra venom is not the highest in toxicity of all snake venoms.

There are several snakes whose

CHART SHOWING RESULTS OF USE OF VENOMIN

CASE	HISTORY and PREVIOUS TREATMENT	VENOMIN TREATMENT	RESULT
1—"R"	Pain and stiffness in both arms, shoulders, knees, no luetic history. Wassermann negative. Previous treatment with colloidal sulphur (intravenous) iodides and salicylates.	Venomin injected intradermally for six weeks.	Very much improved, but not entirely cured when had to leave for North.
2—"S"	Pain, stiffness in neck, shoulders and knees for nine years. Wassermann negative; no luetic history. No relief from previous treatment with iodides, salicylates, or colloidal sulphur.	Given three intradermal injections.	Great relief from pain obtained after injection. Patient steadily improving until left for home in North.
3—"Mrs. EJM"	Age 50. Severe pain in left arm and shoulder. Inability to raise arm. Pain in other parts of body. Pain getting worse for several weeks.	Given intradermal injection of Venomin "A" in shoulder and arm. Four doses in bi-weekly injections.	Almost complete relief in an hour. Little trouble after second treatment. No return of trouble since third dose.
4—"Mrs. B."	History of extensive burns on back of both legs, thighs, buttocks, lumbar region. Complained of pain in left side with considerable swelling from ribs down to pelvis.	Administered Venomin intradermally in left side in four weekly treatments.	Improvement marked from start. Little trouble since.
5—"K"	Pain and stiffness in neck for 10 years. No luetic history. Wassermann negative. Had treated at well-known clinics all over the country. No benefit from salicylates, iodides, colloidal, sulphur, serums and bacterin treatments, or short wave diathermy.	Intradermal injection of Venomin given for eight months at intervals of a week, or 10 days.	Almost immediate relief. Very little trouble now. Continues to improve. Declares it is only relief he has ever had.
6—"A"	Unable to work for eight months because of neuritis in arms, shoulders, hands. Could not raise arms from side. Could not grasp anything. Swelling and stiffness of fingers. Stiffness in knees. No benefit from previous treatments.	Intradermal injection of Venomin was given over each shoulder. Venomin further administered at intervals of one week to 10 days.	Almost immediate improvement. Patient has been working at his trade as carpenter since third treatment. Now able to raise arms straight up; open and shut fingers. He has gained 20 pounds.
7—"Mrs. M."	Age 60. Brought to office with great difficulty. Hands, arms, legs very lame and painful. Small joints badly crippled. Severe pain in left gluteal region, entire length of sciatic nerve and branches.	Intradermal injection of Venomin "A" given in both shoulders and left thigh. Venomin "B" administered second week; then Venomin "C". Three intradermal injections of Venomin "C" given in gluteal region down over sciatic nerve trunk to knee. Nine treatments in weekly intervals.	In one week, patient was able to raise her arms, close her fingers. After five or six treatments she stated she felt pain only in the left gluteal region. Three intradermal injections of Venomin "C" in that region gave prompt relief. Patient considered herself cured. Ceases taking more treatments.
8—"G"	Injury from gunshot wound of many years standing. Suffered from pain in nerves of left arm.	Gave patient a few intradermal injections of Venomin "A," "B", and "C."	Relief obtained. No further trouble to present time.
9—"Mrs. R."	Pain in both arms and hands. Troubled for months.	Three intradermal injections of Venomin given.	Prompt relief. No further trouble. Patient disturbed by ecchymosis.
10—"G"	Physician's wife. Sharp attack of mastoiditis. Left her with severe pain and faulty hearing.	Four intradermal injections of Venomin given in back of neck.	Rapid improvement. Removal of tenderness, and clearing up of hearing which is now normal.
11—"Mrs. S"	Pains in back and side. Neuralgic type. Troubled for several months.	One intradermal injection of Venomin "A" given.	Patient is cured.
12—"J"	Hard drinker; man of leisure. Positive Wassermann. Old luetic history. Suffering from multiple neuritis. Despondent with suicidal tendencies. Treated with colloidal sulphur with little relief. Given a choice between drink or neuritis, he abstained for several months, during which time he improved rapidly. Returned few weeks ago with neuritis in left sciatic nerve.	Given one intradermal injection of Venomin "A" in sciatic nerve region.	Neuritis in left sciatic nerve promptly disappeared upon injection.

venom has greater toxicity than that of the cobra. At least two marine snakes, the Enhydrina and the Distina, have a venom much more toxic than that of the cobra, and moreover, recent findings show that the venom of the European sandadder (Vipera ammodytes) is superior to cobra venom in analgesic effect, although it is far inferior to cobra venom in its toxicity. In short, modern findings suggest that it is justifiable to assume that the therapeutic effects of the zootoxins can not be limited alone to the neurotoxic fraction of the venom or the toxicity connected therewith.

Believing, therefore, that the analgesic effect of snake venom and its value in therapeutics cannot alone explain its curative effects as shown by many experiments, and that the evidence indicates a deep effect upon metabolic processes in the human body, it appears plausible that experimentation with zootoxins containing a large percentage of hemotoxic principles, as well as the neurotoxic, might lead to more profound and satisfactorily permanent results.

Attention has been drawn to the venom of the pit vipers, such as the rattlesnake, the water-moccasin, and the copperhead. In passing on to other considerations, it might be pointed out that the venom of the Crotalus, Sistrurus, moccasin, and copperhead softens the walls of the bloodvessels and has a hemolytic effect upon the blood cells and demonstrably affects metabolism.

The venom increases the eosinophiles. In fact, Spangler applied the observed increase of eosinophiles as a guide to dosage and frequency of administration. After an injection of venom, the number of eosinophiles rises and subsequently drops, and when the subsidence has reached 4% or a little less, above normal, the injection may be continued. The dosage is not increased when a certain dosage produces an eosinophilia of eight to ten per cent above normal within two or three days after injection. After each treatment, the organism is considered as to some extent desensitized.

The copperhead (Ancistrodon contortrix) has a rather large proportion of the neurotoxic element than has the rattlesnake, and yet is not quite so fatally toxic as the water-moccasin and only about one-fifth as deadly as the diamondback.

Concentrated and purified solution of moccasin and coral-snake venom has been used in the experiments mentioned.

The venom is obtained from freshly captured snakes, which, after the recovery of the venom, are released again. Venom from snakes, kept long in captivity is of inferior quality, as the changed conditions under which the reptile is forced to live, profoundly affect the venom, as the reptile can never continue in his normal health and vigor, and so consequently cannot produce his best quality venom under such surroundings.

The venom, after recovery, is immediately dried by means of high vacuum under carbon-dioxide snow freezing. Venom left standing at ordinary temperatures is rapidly decomposed by oxidation, and changes

CHART SHOWING RESULTS OF USE OF VENOMIN

CASE	HISTORY and PREVIOUS TREATMENT	VENOMIN TREATMENT	RESULT
13—"Mrs. "D".	Suffering from arthritis of acute type, involving hands, arms, left knee. No relief from salicylates or iodides.	Given intradermal injection of Venomin "A."	Patient says she has never had such prompt relief before.
14—"L"	Anemic. Wassermann negative. Pain in left lumbar region, muscular nature. Gave Lextron (Lilly) which relieved the anemia but did not benefit lumbar pain.	Gave two injections of Venomin.	Lumbago stopped immediately.
15—"C"	Pain and rigidity in shoulders and back of neck for many years. Partial relief obtained from aspirin.	Gave Venomin "A" high up in back of neck and shoulders; followed this by injections "B" and "C"; treatment continued at weekly interval.	Relief to marked degree obtained from first injection. Benefit still continues.
16—"D"	Teacher. Returned from vacation with nerve pains in both legs below knees.	Twenty-three days after pain started, intradermal injections were given.	Five days after first injection, pain in legs gone. No further treatment necessary.
17—"F"	Eighty years old. Suffered from lumbar pains for many years, muscular. Pains in wrist from an old fracture received 17 years previous. Wrist frequently lame and painful.	Intradermal injection of Venomin "A" and later "B" on the same day were given in the arm near the shoulder on the side of injured wrist. Two intradermal injections of Venomin "C" 1/20 cc. were given on each side of spine, about three inches laterally thereto, in lumbar region.	Wrist so much improved after first and second injection that patient asked for same treatment of lumbar region. Wrist now gives no trouble, and back daily improving.
18—"W"	Age 50. Suffering from rheumatoid arthritis of shoulders, neck, elbows, and wrists. Treated in Northern hospital for many weeks with colloidal sulphur, intravenously, iodides, sodium salicylates, with no benefit. Pain returned with increased violence after leaving off salicylates. Wrists swollen to twice normal size, and pain agonizing.	Given Venomin "C"s treatment continued at intervals of three days for 10 weeks at which time swelling disappeared.	Injection produced swelling and ecchymosis with considerable relief of pain. Swelling gone; joints free and flexible; improving rapidly. Outlook hopeful and confident.
19—"Mrs. E.A.H."	Old wrist injury of several years standing. Pain and tenderness localized between cuneiform and pisiform bones; probably a carpal dislocation with early laceration of ligaments binding these bones together.	Tight bandaging of wrist with two doses of Venomin given 10 days apart.	Prompt relief obtained.
20—"E.J."	Age 26. Herpes zoster involving upper three lumbar nerves. Eruption entirely in vesicular stage. Grey ganglion on root of sensitive portion of nerve seemed involved.	Venomin "C" given intradermally over upper lumbar nerves branches.	Three days after injection cutaneous eruption had entirely disappeared, and young man declared there was no pain or soreness.
21—"C"	Sixty years of age. Well developed case of shingles, partly in vesicular stage, partly in pustular with few scales. Three upper dorsal nerves involved.	Two intradermal injections of Venomin were administered; three more injections were made three days later.	Two days after first two injections of Venomin, vesicles disappeared, and pustules had become scabbed. All irritation subsided and older scabs dropped off. Five days later case entirely healed.
22—"L. G."	Old shoulder injury sustained in a fall over a year ago. Patient suffered pain and stiffness of left shoulder; lost ability to lift arm away from side.	Gave Venomin twice a week, intradermally. Exercised arm. To date, three months treatment. Venomin continued.	All pain gone, gaining use of arm, and feels that only time is needed for full recovery.
23—"GWL"	Age 78. Pain and tenderness in right knee.	Had three administrations of Venomin at four days interval.	Much improved, but feels that he will get well, and probably will not continue long enough to insure care.
24—"F. F."	Age 68. Walked with great difficulty. Pain in thighs and knees had been increasing for months.	Gave Venomin injections in both thighs and knees, and repeated treatment at three-day intervals.	Pain practically gone, and patient is now back at work again.
25—"HFD"	Long treatment in Northern hospitals with colloidal sulphur salicylates, iodides. Pronounced incurable.	Gave three Venomin injections intradermally.	Less pain already. Had renewed interest in life with a will to recover.

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BIOLOGICAL PRODUCTS

by Dr. Louis Gershenfeld, P.D., B.Sc., Ph.M.

Professor of Bacteriology and Hygiene, Philadelphia College of Pharmacy and Science; Member of U. S. P. and N. F. Advisory Revision Committees; Consultant Author, etc.

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from an odorless fluid of high viscosity to a fluid of low viscosity, and foul odor. Hence, the care in its preparation.

Vial labelled "A" is the first treatment strength, and should be followed by quite a marked, but by no means painful reaction, and will show early ecchymosis lasting many days.

Vial labelled "B" is the second treatment strength and shows still greater hemolysis and ecchymosis.

Vial labelled "C" is the third treatment strength and is, of course, still much more active, and is the highest strength generally used.

The Venomin is always given intradermally—never hypodermically, intramuscularly, or intravenously — as it is essential that it should be absorbed as slowly as possible into the vascular system.

A tuberculin syringe is admirable for administering the Venomin because the dosage may be accurately measured. It should ordinarily be about 1/20 cc. The needle should be of about 25 gauge, as stiff as possible, and should be used to split the skin and raise a small wheal.

Considering the striking effect of Venomin in cases of herpes zoster,[3] and knowing the now proven relationship of zona to chickenpox, the author would be inclined to try tentatively about four intradermal injections of Venomin in early chickenpox cases, giving the injections just as each side of the spine over the location of the brachail and lumbar plexus of nerves. It might also be a good suggestion to use Venomin in recurring herpes of any part of the body.

In investigating the Venomin, the author tried to seek for truth. Neither a cure-all, nor the limbering up of ossified joints were expected, but ample material benefit from Venomin use has been found in fully 90% of cases, and symptomatic cures in at least 85%, and demonstrable cures in 66% of all cases.

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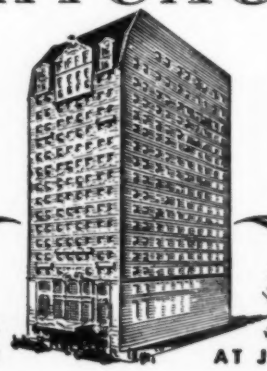

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With the limited space at the author's disposal, it is impossible to go into further detail. Consequently, only the typical cases coming to one in office practice have been selected.

1. Pepeu, F.: Die tierischen Gifte in der Therapie. *Deutsche med. Wchnschr.*, 64:1109, 1938.

2. Burkardt, A.: Treatment of Rheumatic disorders with snake venom. *Deutsche med. Wchnschr.*, 61:1159, 1935. Abstr. *J.A.M.A.*, 105: 840, 1935.

3. Kelly, J. Richard: Treatment of herpes simples with moccasin venom. *Arch. Dermat. & Syph.*, 38: 599, 1938.

Current Abstracts

Industrial Dermatitis from Gloves. W. D. Norwood and E. E. Evans. *J.A.M.A.*, vol. 114, pp. 1523-1528 (April 20, 1940).

The authors examined and studied 20 men who were required to wear rubber gloves in a section of a plant manufacturing tetra-ethyl lead. Tests were made of scrapings from the feet in every instance to determine the presence of fungi or yeast. Intradermal reactions were done with trichophytin and oidiomycin. So-called therapeutic tests with different types of gloves were also made and instances were tried where no gloves were used.

The authors conclude that the dermatitis has been shown to be caused by two factors: (1) the traumatizing effect of the gloves and (2) allergic sensitization of the hands due to the presence of dermatophytosis elsewhere (usually on the feet).

The name of "leather-phytids" has been suggested as expressing in two words what has required many sentences to explain. Further suggestion is made that where dermatitis is due to a combined sensitivity to a chemical and a mycotic infection, one might well use the words "chemical phytids."

A successful method of treatment was used involving the application of a powder to the feet, the powder being composed of salicylic acid 5 gm., menthol 2 gm., camphor 8 gm., boric acid 50 gm., and starch 35 gm. In the cases due to yeast, gratifying results were obtained by treating the lesions with a 2% gentian violet water. —C. O. Sappington.

Lead Poisoning in Roofers. Harold J. Magnuson and B. O. Raulston. *J.A.M.A.*, vol. 114, pp. 1528-1530 (April 20, 1940).

This investigation involved eight instances of lead poisoning in roofers at the Los Angeles County General Hospital, during a period of six months.

All complained of colic and all but three of constipation of moderately severe degree. Only one presented evidence of neuritis and which was limited to paresthesia involving the arm. None presented indications of notable neurological changes. The lead line was present in three instances. Stippling was present in all but one case. Spectrographic examinations of the blood showed pathological amounts of lead in every instance. Lead poisoning was the admission diagnosis on but three of the eight cases.

The source of the lead was from roofing nails which contained 3 per cent of lead in the galvanized coating. The nails were held in the mouth while working. In no instance was there a history of any other exposure to lead.

In conjunction with this investigation, the authors found experimentally that 4 micrograms of lead were found to be dissolved in a specimen of pooled saliva at the end of four hours, the source being 30 nails. It is the belief of the authors that it would not take a great number of nails to cause a toxic level of lead to be reached, especially if it is considered that the amounts soluble in the saliva probably represent but a fraction of the amount ingested.

The authors suggest the possible value of serum lead determinations in the prognosis of this type of cases. —C. O. Sappington.

High Court Speaks on Impartial Physicians.

Workmen's compensation administrators are often confronted with conflicting medical testimony as to the nature and extent of disability and its relation to trauma or employment exposure. In such cases the usual procedure is the selection of an impartial physician to examine the claimant and pass an opinion upon the disputed facts. Because this opinion is often accepted by the administrators as final and conclusive, the role of "impartial examiner" is highly important.

How to find such experts who are completely impartial is often a real problem, because in the natural order of things insurance carriers at some time or another have occasion to retain many, if not most, of the medical specialists in a given locality. The question arises whether a physician who is professionally employed more or less frequently by insurance carriers can be termed "impartial" from the viewpoint of the workmen's compensation claimant.

This was precisely the question recently presented to the Supreme Judicial Court of Massachusetts by a compensation claimant in that State. It is thought to be the first case of this kind passed upon by a high court. In an opinion handed down this month the court held that "it cannot be ruled as a matter of law that a physician is not impartial because merely he has testified in numerous cases on behalf of insurance companies." The court indicated, however, that a different question would arise if the physician had been "habitually employed or consulted by this employee or this insurer in respect to other than the injury here involved." While this ruling on the precise question of law, the Massachusetts opinion, however, contains this significant comment: "We agree with the argument of the employee that it is the duty of the board to exercise all possible care to appoint as impartial physicians under the act only such as are really impartial, and that every effort should be made to avoid the appearance as well as the fact of favoritism or sympathetic inclination towards one party as against the other."

From *Labor Standards*, May, 1940.

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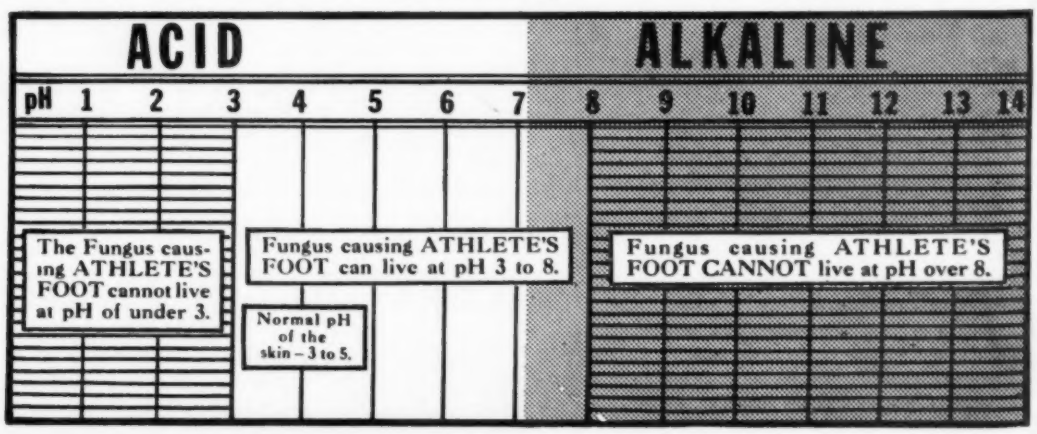
Recent surveys disclose that in the U. S. today, approximately 7 out of every 10 persons over twelve years of age are infected with Athlete's Foot. These surveys are so extensive, and have been conducted by men of such scientific standing, that their results can hardly be questioned. The startling conclusion of the surveys is this:—*today not less than 70 million Americans are infected with Athlete's Foot, and the disease is almost equally common among males and females.*

Now for the first time there is hope of controlling Athlete's Foot with a new powder

In the laboratories of the Mennen Company, there has been produced a powder, known as Quinsana, which is most effective in treating Athlete's Foot. The chart below shows why Quinsana is so effective. It has been found that the organisms causing Athlete's Foot can live only in a medium that has a pH which falls within a certain range. The symbol pH represents the degree of acidity or alkalinity. A pH of 7.4 is neutral; a lower pH is acid—a higher is alkaline. Quinsana creates, on the skin, a pH of 10—at which the fungus causing Athlete's Foot *cannot live.* Moreover, Quinsana (unlike preparations creating a powerfully acid pH) is not irritating to the skin, and may be used continuously over long periods of time.


ACID
ALKALINE
pH 1 2 3 4 5 6 7 8 9 10 11 12 13 14
The Fungus causing ATHLETE'S FOOT cannot live at pH of under 3.
Fungus causing ATHLETE'S FOOT can live at pH 3 to 8.
Normal pH of the skin – 3 to 5.
Fungus causing ATHLETE'S FOOT CANNOT live at pH over 8.

QUINSANA POWDER ACTS 2 WAYS:

QUINSANA is used not only on feet, but also in shoes. Treatment of shoes is an indispensible part of any rational therapy for Athlete's Foot. The organisms causing Athlete's Foot thrive in shoe linings, and unless killed, are always likely to cause re-infection. Ointments and liquids cannot be used in shoes . . . this is an important reason why Quinsana powder is producing such excellent results.

RESULTS PROVE QUINSANA EFFECTIVENESS:

QUINSANA has proved remarkably effective in thousands of cases. Consider the following mass-eradication project in which 1270 citizens of a Southern town were treated for 30 days with Quinsana. Results are typical of those obtained with Quinsana in many thousands of other cases: ➡ ➡ ➡

GROUP TREATED	Percentage having Athlete's Foot	Before Treatment with Quinsana	After 30 Day Treatment with Quinsana
FIREMEN		96.6%	7.3%
POLICEMEN		95.8%	2.2%
NURSES		91%	9.3%
COLLEGE MEN		92.4%	7.2%
COLLEGE WOMEN		70.4%	6.0%
CHILDREN under 12 years		46.6%	0.6%

QUINSANA OFFER TO YOU:

We wish to demonstrate to YOU that Quinsana can control Athlete's Foot for those whose health is directly or indirectly in your charge. Therefore, we offer to send you without charge, several large cans of Quinsana (regular 3 oz. pharmaceutical size), each containing enough powder for adequate treatment of one case of Athlete's Foot. You are requested to report results obtained (it is understood that this information is NOT for publication). The need for a drive against Athlete's Foot is great—your cooperation is urged now. *SEND ATTACHED POSTCARD.*

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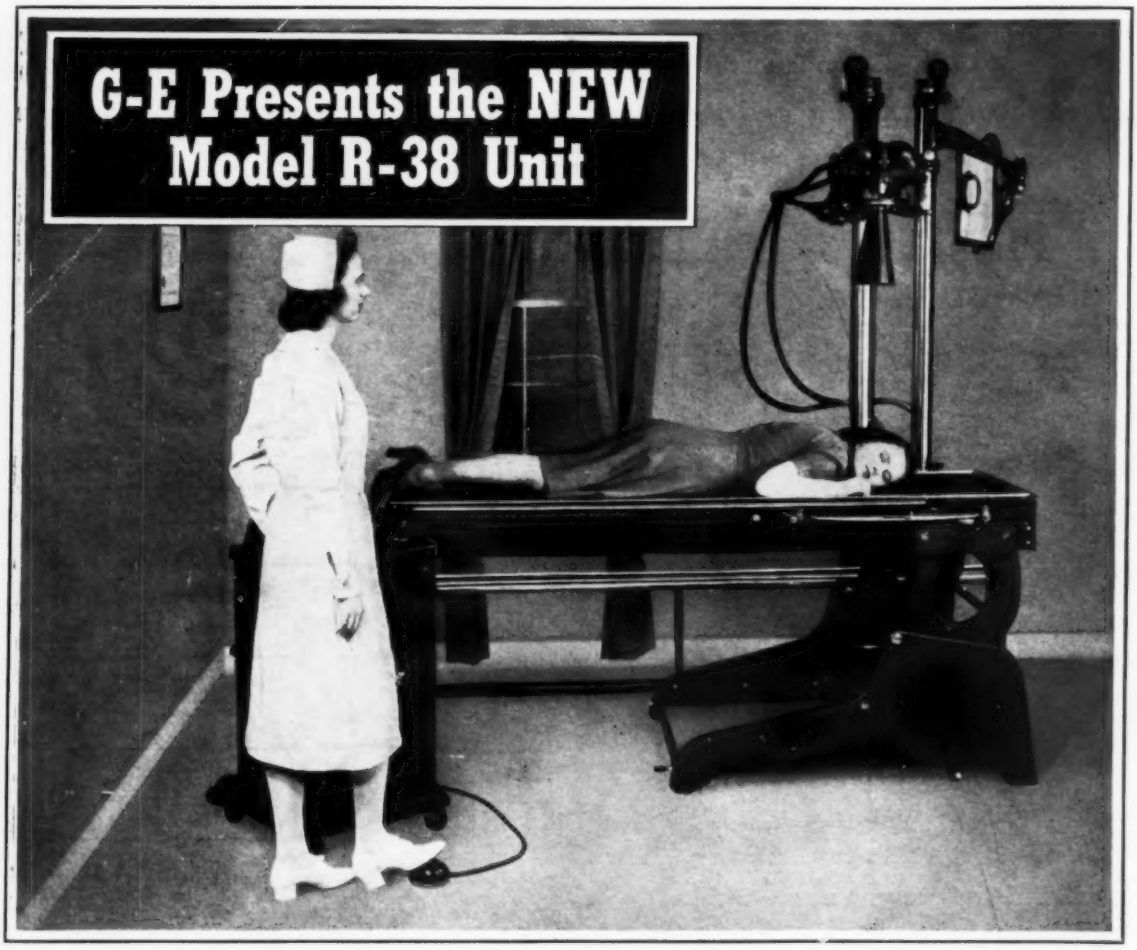

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